3.2 Water Supply and Delta Water Management

This section includes a description of Delta conditions related to water supply (the amount of water available for beneficial uses) and the possible effects of the Intertie on water supply conditions. Beneficial uses of Delta water include in-Delta use (e.g., agricultural and municipal) by other water-right holders, maintenance of fish and wildlife habitat, and export to users receiving water from the CVP or the SWP.

The water supply evaluation of the Intertie relies on the DWR and Reclamation joint planning model—CALSIM II, which is a general-purpose simulation model of the combined CVP/SWP systems, as well as a host of smaller water supply entities with which the CVP/SWP systems interact. As a geographically comprehensive model, CALSIM II includes the Sacramento River basin, the San Joaquin River basin, and the Delta, as well as portions of the Tulare Basin and southern California. CALSIM II provides a platform for assessing changes in Delta water quality and water supply operations of the CVP and SWP projects. All water supply evaluations of the Intertie used the CALSIM II model. Additional material summarized and used in this section can be found in Appendix B, "CALSIM II Modeling Studies of the Delta Mendota Canal/California Aqueduct Intertie."

Referenced figures and tables are located at the end of this section.

3.2.1 Affected Environment

Numerous parties hold rights to divert water from the Delta and upstream Delta tributaries. Various water quality and flow objectives have been established by the SWRCB to ensure that the quality of Delta water is sufficient to satisfy all designated uses; implementation of these objectives requires that limitations be placed on Delta water supply operations, particularly operations of the SWP and CVP, affecting amounts of fresh water and salinity levels in the Delta. None of these protective measures is being modified by the Proposed Action.

Diversion and storage of water in upstream reservoirs by the SWP and CVP and diversion and export of water from the Delta are authorized and regulated by SWRCB under appropriative water rights. The SWP and the CVP store and release water upstream of the Delta and export water from the Delta to areas generally south and west of the Delta. Reclamation diverts water from the Delta through its Tracy Pumping Plant to the DMC, and DWR pumps for export through the California Aqueduct and South Bay Aqueduct at its Banks Pumping Plant in Clifton Court Forebay (CCF). SWRCB first issued water right permits to Reclamation for operation of the CVP in 1958 (Water Right Decision 893 [D-893]) and to DWR for operation of the SWP in 1967 (D-1275 and D-1291).

A third substantial diverter of Delta water is the Contra Costa Water District (CCWD), which currently diverts water from Rock Slough under Reclamation's CVP water rights and from a second intake constructed on Old River near the State Route (SR) 4 Bridge that serves as the pumping plant for Los Vaqueros Reservoir (Contra Costa Water District and Bureau of Reclamation 1993). Several municipal users and many agricultural users also divert water from the Delta under riparian and appropriative rights.

Appendix C, "Supplemental Water Supply Information," contains additional information that is important in understanding the institutional and regulatory framework for water management in the Delta. The appendix also includes a detailed discussion of the regulatory framework for the CVP and SWP Delta operations.

Central Valley Project and State Water Project Delta Facilities and Operations

The following description of CVP and SWP facilities and operational constraints in the Delta is provided to establish current operational conditions needed to evaluate project alternatives for water supply conditions. These constraints are expected to apply in the future without the Proposed Action.

Central Valley Project Delta Facilities

The CVP's Tracy Pumping Plant, about 5 miles north of Tracy, consists of six pumps, including one rated at 800 cfs, two at 850 cfs, and three at 950 cfs (i.e., 5,350 cfs maximum capacity). Maximum authorized (i.e., water rights) pumping capacity is 4,600 cfs. The Tracy Pumping Plant is located at the end of an earth-lined intake channel about 2.5 miles long. At the head of the intake channel, "louver" screens that are part of the Tracy Fish Collection Facility intercept fish, which are then collected and transported by tanker truck to release sites away from the pumps.

Other CVP facilities in the Delta include the Delta Cross Channel (DCC) and the Contra Costa Canal (CCC). The DCC is a gated diversion channel in the Sacramento River near Walnut Grove and Snodgrass Slough. Two 60-foot-wide-by-30-foot-high radial gates control flows into the DCC from the Sacramento River. When the gates are open, water flows from the Sacramento River through natural channels of the lower Mokelumne and San Joaquin Rivers toward the interior Delta to supply the CCC and the Tracy Pumping Plant in the south Delta, with a minimum of seawater intrusion from Antioch.

The CCC originates at Rock Slough, about 4 miles southeast of Oakley, and supplies the CCWD. The canal and associated facilities are part of the CVP but are operated and maintained by the CCWD. CCWD now also operates a

diversion on Old River just south of the SR 4 Bridge that provides the intake for Los Vaqueros Reservoir and connects with the CCC.

Central Valley Project Delta Pumping Capacity

The CVP Tracy Pumping Plant has a maximum authorized capacity of 4,600 cfs. Table 3.2-1 compares the CVP monthly demands to the maximum permitted CVP Tracy monthly pumping. The CVP monthly demands exceed the CVP monthly pumping capacity in the May–August period. This extra water (783 thousand acre-feet [taf]) must be pumped during the winter and early spring and stored in San Luis Reservoir to supply annual allocations for most water years.

If the CVP Tracy pumps were at maximum permitted capacity for the entire year, they could deliver about 3,330 taf/yr from the Delta (about 275 taf each month). This is unlikely to occur, however, because there are required periods for maintenance of the pump units and the hydrology in the Delta does not allow full pumping every day of the year. There is also a DMC capacity limit that currently allows only about 4,200 cfs of pumping during the winter period (November–March) when diversions from the upper DMC (near the Tracy Pumping Plant) are low. This canal limitation reduces the maximum pumping by about 25 taf per month, or about 125 taf for the year. These constraints make is impossible for the Tracy Pumping Plant to supply the full CVP demands.

A CVP delivery of 3,000 taf would require CVP Tracy pumping at an average of more than 90% capacity for the entire year. This is a very high "load factor" for a pumping facility. The demand for water pumped at the Tracy Pumping Plant is currently greater than 3,000 taf/yr.

The Central Valley Project Improvement Act (CVPIA) has introduced additional constraints on the CVP Tracy pumping capacity. A portion of the Section B(2) water that is dedicated to anadromous fish restoration purposes (maximum of 800 taf) is normally allocated by USFWS to reduce pumping during the Vernalis Adaptive Management Program (VAMP) period (April 15–May 15), and additional pumping reductions are often applied during the remainder of May and June (normally a 3,000 cfs limit in May and June). The export/inflow (E/I) ratio of 35% during the February–June period further limits pumping. Therefore, under current regulations, it is impossible for the CVP Tracy Pumping Plant to supply the full CVP demands. The Intertie would allow more of the CVP demands to be satisfied with the Tracy Pumping Plant.

Table 3.2-1. CVP Tracy Demands and Pumping Capacity

Month	CVP Tracy Demand (taf)	Maximum Volume at 4,600 cfs CVP Tracy Capacity (taf)	Additional Needed from San Luis Reservoir (taf)
October	204	283	–
November	123	274	–
December	107	283	–
January	137	283	–
February	166	255	–
March	192	283	–
April	236	274	–
May	344	283	61
June	502	274	228
July	583	283	300
August	476	283	193
September	262	274	–
Total	**3,332**	**3,332**	**782**

CVP = Central Valley Project.
taf = thousand acre-feet.
Source: CALSIM II 2001 LOD

State Water Project Delta Pumping Capacity

The SWP Banks Pumping Plant has an installed capacity of about 10,668 cfs (two units of 375 cfs, five units of 1,130 cfs, and four units of 1,067 cfs). With full pumping capacity, the Banks Pumping Plant is theoretically capable of pumping 7,725 taf each year.

However, the current permitted diversion rate into the CCF is 6,680 cfs as a 3-day average, and the pumping rate cannot be much higher than the diversion rate because the water elevation in CCF cannot be drawn down below –2.0 feet mean sea level (msl) without introducing cavitation (i.e., air entrainment) problems at the pumps. This maximum permitted pumping would provide a maximum of about 4,836 taf/yr if full permitted pumping could be maintained every day of the year. Additional permitted diversions of one-third of the San Joaquin River at Vernalis are allowed under the current permit rule for a 90-day period from December 15 to March 15, if the Vernalis flow is above 1,000 cfs. This additional increment of permitted pumping could yield a maximum of 710 taf/yr (for a total of 5,546 taf) if the San Joaquin River flow at Vernalis was higher than 13,000 cfs for the entire 90-day period (a very unlikely hydrologic condition).

The monthly pumping capacity of Banks Pumping Plant for the basic 6,680 pumping limits is given in Table 3.2-2. The seasonal SWP demands are highest in the summer months, requiring a portion of the demands to be supplied from San Luis Reservoir storage. San Luis Reservoir releases are often needed during these months because the SWP Banks pumping is limited during April–June by a combination of VAMP and the 35% E/I ratio that applies from February through June.

Table 3.2-2. Harvey O. Banks Pumping Plant Demands and Maximum Pumping Capacity

Month	SWP Banks Demand (taf)	Maximum Volume at 6,680 cfs SWP Banks Capacity (taf)	Additional Needed from San Luis Reservoir (taf)
October	295	411	–
November	261	397	–
December	245	411	–
January	173	411	–
February	203	371	–
March	235	411	–
April	302	397	–
May	407	411	–
June	520	397	123
July	541	411	130
August	532	411	121
September	404	397	7
Total	**4,118**	**4,836**	**381**

SWP = State Water Project.
Source: CALSIM II 2001 LOD

Only in a few years will there be sufficient Delta inflow each month to satisfy the in-Delta water diversions, meet the required Delta outflow for water quality and fisheries protection, supply the full CVP Tracy pumping, and also allow Banks pumping of 4,300 taf to supply the entire SWP demand plus aqueduct and reservoir losses that are assumed to be 100 taf/yr.

Central Valley Project and State Water Project Delta Pumping Regulatory Limits

The regulatory limits on SWP Banks and CVP Tracy pumping are important to understanding Delta water management because these regulatory limits

collectively restrict supply of full CVP and SWP demands for Delta exports. These regulatory limits may result from Delta outflow requirements, E/I limits, and permitted export pumping capacity. The Intertie would not change any of these regulatory limits, and would therefore not change the protections provided for water quality and fisheries in the Delta.

Appendix C provides a detailed discussion of the following CVP and SWP Delta pumping regulatory limits and water management requirements:

- Delta outflow requirements,
- position of the 2 parts per thousand (ppt) salinity gradient (X2) objective,
- maximum E/I ratios,
- DCC operations,
- San Luis Reservoir,
- CVPIA water management in the Delta, and
- Environmental Water Account (EWA) operations.

Central Valley Project and State Water Project Surface Water Supply and Demands

Appendix C presents existing water supply conditions in California that are relevant to the potential water supply effects of the Intertie and is, therefore, focused on CVP and SWP reservoirs. The appendix provides a detailed discussion of the following:

- Trinity River Division,
- Lake Shasta,
- Lake Oroville,
- Folsom Lake,
- New Melones Reservoir,
- Delta inflows, and
- San Luis Reservoir.

The results from the CALSIM II simulations of the CVP and SWP reservoir operations were used to describe the operations of these water bodies.

Central Valley Project Water Supply Demands

South-of-Delta CVP demands include agricultural, municipal and industrial (M&I), and wildlife refuge needs served from the San Luis Reservoir and San

Felipe Unit, the Cross Valley Canal, the DMC, and Mendota Pool. CVP demands south of the Delta are always set to contract amount and do not vary based on hydrologic conditions in CALSIM II. These demands also include Friant exchange contractors and operational losses. Monthly demand patterns are determined based on recent historical CVP deliveries.

The 2002 Water Supply Benchmark studies, which use the CALSIM II model, provide a detailed description of the components of the CVP demand that are supplied from the Tracy Pumping Plant. The total CVP water supply demand is about 3,045 taf/yr. There is an additional Cross Valley Canal demand of 128 taf/yr that the SWP has agreed to pump for CVP at the Banks Pumping Plant to allow an exchange of CVP Friant water to supply other CVP Friant water users. There is a requirement under the CVPIA for CVP to deliver Level 2 wildlife refuge water. The CALSIM–simulated Level 2 water supplies total almost 300 taf/yr for refuges located in the San Joaquin River and Tulare River basins that are supplied from Tracy pumping or local water district purchases. The DMC (including the Mendota Pool) and San Luis Reservoir evaporation losses are assumed to be about 185 taf/yr (about 5%) in the CALSIM II benchmark studies.

These combined CVP demands are therefore almost 3,500 taf/yr. The majority of the CVP water supplies agricultural uses, and the CVP demand represents about 10% of the total California agricultural water supply. The current physical restrictions on the DMC capacity, in addition to regulatory measures, limit the ability of the CVP to deliver full contractor and refuge demands.

State Water Project Water Supply Demands

The 26 SWP contractors that receive diverted water from the Delta have a total contract value (also called Table A value) of 4,133 taf/yr (State Water Project Delivery Reliability Report 2002). Additional SWP pumping can occur under Article 21 of the contracts when there is surplus Delta flow and the SWP portion of San Luis Reservoir is full. These additional Article 21 deliveries can sometimes be made in the wet months of December–March once the SWP portion of San Luis Reservoir is full.

The Metropolitan Water District of Southern California (MWD) is the largest SWP contractor, with a Table A value of 2.0 maf. There are 12 other contractors in southern California, with delivery entitlements that total 580 taf, whose water must also be pumped over the Tehachapi Mountains through the Edmonston Pumping plant (maximum capacity of 3,250 taf/yr). The Edmonston pumping plant therefore provides a limit for the SWP deliveries to southern California, as a maximum of 3.0 maf can be pumped (with one unit held in reserve). Delivery of the maximum Table A value of 2.58 maf would require operating the Edmonston pumping units at about 85% of capacity.

The San Joaquin Valley agricultural contractors have a combined Table A value of about 1.2 maf (the Kern County Water Authority has a Table A value of 1.0

maf). The South Bay aqueduct has a total Table A value demand of 220 taf. The North Bay aqueduct supplies an Table A value demand of about 76 taf, but this is not pumped at the Banks Pumping Plant.

3.2.2 Approach

Methodology

Evaluation of the effects of the Intertie on CVP and SWP water supply conditions that may be affected by the Proposed Action uses the CALSIM II model, which simulates monthly CVP and SWP reservoir operations and Delta export pumping patterns for the 1922–1994 historical period of hydrology (runoff and estimated local water uses). The water supply evaluation using the CALSIM II model allows a quantitative approach for comparing the water supply reliability (i.e., ability to consistently meet the water supply demands) of the Proposed Action.

Significance Criteria

Numerous environmental documents have been published over the past 10 years that have addressed hydrologic and water supply changes to the CVP and SWP potentially resulting from implementation of a project or program. Most of the documents reviewed do not consider changes in hydrological or water supply conditions resulting from project operations, in and of themselves, to be environmental effects. Rather, such changes are often considered to be the causative agents that may result in impacts on other resources such as water quality, fish, recreation, groundwater, and agricultural resources. There are no established significance criteria for water supply changes for either the CVP or the SWP. The magnitude of the simulated changes can be judged relative to the Existing Condition (2001 LOD) and No Action (2020 LOD) to allow the effects (i.e., differences) of the Proposed Action on water supply conditions to be evaluated. No mitigation of water supply changes is required because these changes are not considered to be environmental impacts. The magnitude of the simulated changes is described in the following section.

3.2.3 Environmental Consequences

The results presented in this section are used to drive subsequent analysis of the environmental consequences of the Proposed Action and No Action Alternative for each resource area. Significance criteria are established for each resource area. Because the only likely water supply changes would be a slight increase in CVP pumping and a possible shifting of water between CVP and SWP in accord with the COA and all other Delta objectives and fish protection programs, no

substantial physical environmental impacts are expected from water supply changes.

Existing Condition (2001 Level of Development)

The water supply and Delta management baseline for the evaluation of Proposed Action effects is established as the Existing Condition at a 2001 LOD. The 2001 Existing Condition baseline against which the Proposed Action is evaluated is presented in tables and plots in sections to follow.

No Action Alternative (2020 Level of Development)

The water supply and Delta management future baseline for the evaluation of Proposed Action effects is established as the No Action Alternative at a 2020 LOD. Under the No Action Alternative, an Intertie would not be constructed or operated, and no change in Delta water supply conditions would result. No changes in operations would occur at Tracy Pumping Plant or the DMC; therefore, the Tracy Pumping Plant would not be able to restore its capacity to pump to the authorized amount of 4,600 cfs. The water supply results of the No Action Alternative are shown below.

Proposed Action Alternative

The Intertie is expected to make some improvements in CVP water supply reliability without having any major impacts on the SWP or on local water supplies, including the water diversions that supply agricultural water needs in the south Delta. The Intertie would reduce the reliance of CVP deliveries on wheeling at Banks Pumping Plant but may reduce the SWP supply because the SWP sometimes captures CVP water from upstream reservoir releases that cannot be physically pumped at Tracy with the current DMC limitations. Slightly earlier filling of San Luis Reservoir may allow CVP pumping surplus water (Section 215) to contractors in some years. CVP Section 215 water is not included in the CALSIM II model.

Changes in Central Valley Project Water Supply Pumping and Deliveries under Existing Condition (2001 LOD)

This section identifies changes attributable to implementing the Proposed Action compared to the Existing Condition. This is accomplished by comparing the CALSIM II model results for the 2001 LOD with the Proposed Action (i.e., Proposed Action) and the 2001 LOD without the Proposed Action (i.e., Existing Condition).

Pumping

Tables 3.2-3a–c (located at the end of Section 3.2) provide the simulated monthly CVP Tracy pumping for the 73-year period of CALSIM II simulation. Table 3.2-3a gives the simulated Existing Condition pumping arranged by water years, Table 3.2-3b gives the monthly simulations for the Proposed Action, and Table 3.2-3c gives the monthly differences for the 73-year period of simulation. The CVP Tracy monthly pumping is given in units of flow (cfs). The simulated Existing Condition annual (water year) CVP Tracy pumping ranged from a minimum of 820 taf (in 1933) to a maximum of 2,837 taf (in 1971), with an average annual total pumping of 2,215 taf/yr. Looking at Table 3.2-3c, the Proposed Action provides an average increase of 64 taf/yr (about 3% of the average annual total baseline CVP pumping). While CVP pumping increased 64 taf/yr, overall average annual deliveries south of the Delta increased by only 34 taf/yr because of reductions in the use of Banks Pumping Plant for CVP exports. This change is a relatively small fraction of the simulated total pumping but is considered a substantial change in CVP pumping capability that also provides increased operational flexibility.

Table 3.2-4 shows the monthly distribution of simulated CVP Tracy pumping for the simulated Existing Condition and the Proposed Action. The monthly values are sorted from minimum to maximum, and for the 73-year simulation period the 10% values from the cumulative distribution (i.e., lowest, 8^{th}, 15^{th}, 22^{nd}…73^{rd} lowest) are selected, to summarize the probability of pumping flows during a month. For example, the minimum October pumping value was 1,352 cfs, the median (50%) value was 4,135 cfs, and the maximum value was 4,391 cfs. For the baseline simulation, during October there was a 50% probability that the CVP Tracy pumping would be greater than 4,000 cfs and close to the maximum physical capacity without the Proposed Action. The simulation of the Proposed Action indicates that the October CVP Tracy pumping would be slightly higher than the simulated Existing Condition values, with the minimum pumping slightly higher at 1,474 cfs, the median slightly higher at 4,258 cfs, and the maximum at 4,600 cfs. The October pumping would be at this maximum value in about 40% of the years with the Proposed Action. On average, the October CVP Tracy pumping would be increased by about 150 cfs. The other fall and winter months reveal a similar pattern, with increases simulated in the highest CVP Tracy pumping. CVP Tracy Pumping was slightly lower in March with the Proposed Action because San Luis Reservoir was filled earlier with the additional Intertie pumping.

During April and May, CVP Tracy pumping is reduced to comply with the VAMP period conditions that are assumed to occur from April 15 to May 15. The CVP pumping during the VAMP period ranges from 750 cfs to 1500 cfs depending on the flow target at Vernalis. CVP Tracy pumping in the second half of May and all of June is limited to 3,000 cfs by an assumed B(2) allocation of CVP water supply yield for fish protection. The CVP Tracy pumping in April and May was identical for the simulated Existing Condition and Proposed Action. Under the Proposed Action, CVP Tracy pumping in June was slightly higher in some of the lower pumping years.

Table 3.2-3a. CALSIM II Simulated CVP Tracy Pumping (cfs) for Existing Condition (2001 LOD)

Base [EWA], Tracy Export (CFS)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1922	4391	3915	3414	4232	3939	4036	1500	1500	3000	4565	4525	4466	2625
1923	4337	4248	3408	3210	2019	2660	800	800	3000	4558	4520	4463	2301
1924	4135	2906	1730	4225	3580	800	800	800	800	600	1102	2376	1439
1925	1898	1702	2905	3659	4218	2105	2747	2093	1436	2888	4486	4409	2079
1926	3699	3061	1274	4221	3920	2096	800	800	921	800	992	3244	1549
1927	1637	4218	3398	4214	3909	4036	1500	1500	2890	4558	4520	4463	2462
1928	4317	4247	3408	4225	4241	4275	2547	800	1808	4563	4524	4465	2627
1929	3864	4120	4221	4225	3574	1075	800	800	864	1086	1420	2767	1734
1930	3052	999	4210	4213	3432	4243	1636	800	1663	1499	3204	3571	1964
1931	3372	3338	1130	4044	2345	800	800	800	1105	800	600	2188	1282
1932	1724	1486	3396	4211	3914	2555	1125	1125	1451	1560	4286	4237	1878
1933	3350	1060	612	490	745	600	800	800	800	800	600	2927	820
1934	3024	1294	4209	3300	717	960	800	800	800	600	600	2028	1162
1935	1352	3515	2837	4213	1856	2317	1500	1356	2847	1648	4452	4335	1946
1936	3234	2119	2915	4217	800	2132	800	800	2365	3556	4493	4425	1936
1937	4227	2139	2531	4222	3922	3504	1500	1500	2200	1571	4458	4348	2178
1938	4270	4227	1967	1329	800	1466	800	800	3000	4567	4527	4467	1952
1939	4339	2731	800	2399	2358	2247	1125	1125	3000	3955	3445	3654	1882
1940	2343	2451	2890	4223	4238	4255	2947	2274	3000	4271	4509	4457	2532
1941	4321	3541	3407	4224	4240	4036	800	800	3000	4554	4517	4462	2528
1942	4329	4246	3408	3282	1558	2868	1500	1500	3000	4569	4528	4468	2378
1943	4340	4249	3409	3339	2062	1659	800	800	2238	4561	4522	4464	2205
1944	4334	3867	2466	4225	3937	3993	1500	1500	2343	4231	3686	4419	2451
1945	2612	4237	3405	4222	3921	4001	800	800	3000	4545	4510	4458	2443
1946	4322	4243	4220	4224	2338	3517	2407	2274	3000	4582	4538	4473	2672
1947	4351	4252	3410	4227	4246	3807	1798	800	1693	4518	4201	4417	2516
1948	2096	2716	2281	4222	4235	3133	2547	800	3000	4536	4503	4447	2326
1949	4315	3818	3909	3289	2931	4245	1831	1911	3000	4571	3678	4468	2537
1950	3642	4052	2347	4226	3929	3963	800	800	2479	4483	4463	4358	2385
1951	3284	4228	3402	4218	2183	2819	800	800	1720	4560	4521	4464	2240
1952	4333	4247	3408	4225	3937	4036	1500	1500	3000	4562	4523	4465	2647
1953	4335	4247	3131	1699	2310	1706	2375	1125	3000	4575	4533	4470	2264
1954	4345	4251	4222	4227	4245	4278	2747	1125	2850	4600	4553	4481	2770
1955	3896	4257	4224	4229	3462	2684	1744	1769	3000	2101	2457	4033	2281
1956	2784	4232	3403	4220	3928	2292	2517	800	2953	4571	4529	4468	2459
1957	4341	4250	4006	1763	2392	2636	2698	2093	3000	4600	4555	4482	2467
1958	4368	4258	3411	4229	3934	4036	1500	1500	3000	4565	4525	4466	2643
1959	4337	4248	2925	1721	2337	2618	1810	2030	2616	4098	4546	4477	2282
1960	3841	2367	1371	4228	3942	3946	800	800	1693	4452	4380	3215	2123
1961	3568	3660	3031	3736	4226	4034	1651	800	1678	4556	4518	4462	2407

Table 3.2-3a. Continued

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1962	3124	2783	3347	4077	4242	4276	2040	1125	2326	4554	4517	4377	2460
1963	4329	4245	3407	4225	4242	4280	2547	800	2574	4581	4537	4472	2667
1964	4349	4252	4223	4227	2889	2337	2180	800	2423	3138	4485	3855	2371
1965	2567	4074	4217	4221	4235	4270	2947	2274	3000	4600	4563	4486	2741
1966	4376	4260	4225	4230	4251	4271	1125	1125	3000	4552	4515	4461	2679
1967	3388	4245	3407	4224	3926	4036	800	800	3000	4545	4510	4458	2494
1968	4322	4243	3786	1564	2072	2634	2240	1883	2405	4599	4551	4323	2340
1969	3631	4256	3411	4229	3933	4036	1500	1500	3000	4567	4527	4179	2581
1970	3089	1875	800	2111	1675	2614	2164	800	2006	2254	4529	4468	1714
1971	4341	4249	4222	4226	4244	4280	2747	2093	3000	4594	4547	4478	2837
1972	4359	4255	3808	4228	4246	4275	1652	800	3000	4542	4507	4017	2644
1973	4004	4243	3407	4224	3925	4036	1500	1500	2770	4555	4518	4462	2604
1974	4330	4246	3408	4225	3927	4036	800	800	2765	4552	4515	4461	2539
1975	4327	4245	3407	4224	4241	2649	1500	1500	3000	4570	4529	4468	2572
1976	4341	4249	3409	4226	2158	2764	1412	1281	800	800	1683	2882	1818
1977	2339	1636	800	2331	800	800	800	800	1502	2273	2927	2810	1200
1978	3065	1798	3397	4212	4221	3416	800	800	2916	4583	4539	4473	2305
1979	4351	4253	3738	3757	2509	2622	2723	1500	3000	4587	4037	4475	2511
1980	4354	3651	3410	4228	4245	4278	2050	800	2428	4583	4539	4473	2605
1981	4351	4024	2978	2412	2510	2624	2304	1125	2803	4595	4548	4189	2324
1982	3188	4255	3411	4228	3933	4036	1500	1500	3000	4546	4511	4459	2568
1983	4323	3734	800	1554	1174	1658	800	800	3000	4567	4527	4467	1900
1984	4339	1450	1171	1447	2258	2627	2760	1500	2354	3985	4542	4475	1992
1985	4354	4253	4223	4228	3605	2943	800	800	2141	4529	4498	4435	2465
1986	3315	2603	3406	4222	3923	3989	800	800	2369	3357	4506	4453	2277
1987	4318	4242	4212	4223	3593	1883	1762	1453	1896	1887	1840	3475	2095
1988	2523	3050	2981	4219	4231	800	1415	1404	800	1060	2060	2973	1659
1989	2801	2148	2631	3392	1162	4217	2384	800	1854	4230	4152	3461	2017
1990	3213	3560	4216	4219	3685	2558	800	1145	800	800	1513	2524	1748
1991	2691	1379	1764	1534	800	3946	800	800	1230	1427	1476	4251	1339
1992	2935	1142	1855	2586	4222	3398	800	1415	800	800	1895	2717	1483
1993	3015	2342	3404	4221	4235	4275	1125	1125	3000	4555	4518	4462	2430
1994	4330	4246	2614	4225	4242	2529	800	800	1510	4590	4544	4324	2336
Avg.	**3662**	**3435**	**3062**	**3654**	**3211**	**3067**	**1543**	**1179**	**2311**	**3600**	**3867**	**4082**	**2215**
Min.	**1352**	**999**	**612**	**490**	**717**	**600**	**800**	**800**	**800**	**600**	**600**	**2028**	**820**
Max.	**4391**	**4260**	**4225**	**4232**	**4251**	**4280**	**2947**	**2274**	**3000**	**4600**	**4563**	**4486**	**2837**

Table 3.2-3b. CALSIM II Simulated CVP Tracy Pumping (cfs) for Proposed Action at the Existing Condition

Alt [EWA], Tracy Export (CFS)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1922	4600	3914	3787	4600	4285	3488	1500	1500	3000	4572	4600	4600	2682
1923	4600	4600	3787	4600	2090	2660	800	800	3000	4600	4600	4600	2467
1924	4183	2841	1796	4600	3580	800	800	800	800	800	1106	2687	1496
1925	2436	1696	2887	3748	4600	1433	2747	2093	1460	2848	4493	4600	2106
1926	3699	3018	1274	4600	4285	2134	800	800	1011	940	1265	3226	1622
1927	1730	4600	3787	4600	4285	2933	1500	1500	2900	4600	4600	4600	2508
1928	4307	4600	3787	4600	4600	3764	2547	800	1808	4600	4600	4600	2698
1929	3898	3717	4254	4435	3575	1076	800	800	1222	1124	1435	2667	1745
1930	2883	1296	4600	4600	3429	4600	1641	800	1706	2084	2321	3559	2024
1931	3195	3337	1344	4105	2595	800	800	800	877	800	1013	2287	1320
1932	1809	1467	3787	4600	4296	2555	1125	1125	1454	1553	4201	4326	1952
1933	3703	2032	644	540	806	600	800	800	800	800	600	2927	908
1934	3024	1293	4341	3231	717	830	800	800	800	600	600	2021	1158
1935	1474	3427	2883	4600	1995	2461	1500	1338	2839	1645	4452	4600	2006
1936	3167	2038	2783	4600	800	2161	800	800	2377	3771	4488	4600	1969
1937	4173	2159	2531	4600	4285	3191	1500	1500	2200	1572	4600	4600	2223
1938	4512	4600	1977	1085	800	1466	800	800	3000	4600	4600	4600	1989
1939	4600	2219	800	2399	2358	2257	1125	1125	3000	3986	3467	3663	1872
1940	2341	2441	2886	4600	4600	4600	2947	2274	3000	4548	4600	4600	2618
1941	4376	3772	3787	4600	4600	3314	800	800	3000	4600	4600	4600	2583
1942	4600	4600	3626	2167	1566	2868	1500	1500	3000	4569	4600	4600	2374
1943	4600	4600	3787	4600	2776	1672	800	800	2248	4600	4600	4600	2399
1944	4600	3867	2423	4600	4296	3925	1500	1500	2343	3990	3482	4584	2486
1945	2674	4600	3787	4600	4285	3008	800	800	3000	4600	4600	4600	2491
1946	4555	4600	4600	4600	1804	3530	2410	2274	3000	4600	4600	4600	2738
1947	4406	4600	3787	4600	4600	3835	1798	800	1720	4541	3940	4600	2605
1948	1935	2923	2338	4513	4600	3136	2547	800	3000	4600	4600	4600	2390
1949	4600	3449	3897	3290	2954	4600	1830	1911	3000	4600	4071	4600	2589
1950	3499	3732	2663	4600	4285	4117	800	800	2481	4486	4600	4600	2452
1951	3233	4600	3787	3612	1272	2819	800	800	1720	4600	4600	4600	2210
1952	4600	3844	3787	4600	4296	4297	1500	1500	3000	4600	4600	4600	2738
1953	4600	4600	2555	1810	2447	1706	2375	1125	3000	4600	4600	4600	2294
1954	4600	4600	4600	4600	4600	3700	2747	1125	2850	4600	4600	4600	2847
1955	3970	4600	4600	4600	2972	2700	1755	1762	3000	2734	2947	4009	2394
1956	2907	4320	3787	4600	4296	1646	2517	800	2960	4570	4600	4600	2512
1957	4600	4600	4600	3282	2390	2636	2699	2093	3000	4600	4600	4600	2643
1958	4600	4600	3787	4600	4285	4253	1500	1500	3000	4600	4600	4600	2771
1959	4600	4600	2521	1877	2535	2618	1810	2023	2627	4080	4600	4555	2322
1960	4258	2459	1378	4475	4296	4020	800	800	1721	4600	4262	3244	2200

Table 3.2-3b. Continued

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1961	3560	3747	3031	3741	4600	4032	1651	800	1715	4600	4600	4596	2450
1962	3176	2735	3353	4113	4600	4600	2040	1125	2326	4600	4600	4376	2510
1963	4600	4600	3787	4600	4600	3797	2547	800	2574	4600	4600	4600	2754
1964	4600	4600	4600	4600	2250	2338	2240	800	2753	3908	4168	3833	2466
1965	2713	4094	4600	4600	4600	4035	2947	2274	3000	4600	4600	4600	2813
1966	4600	4600	4600	4600	4537	4600	1125	1125	3000	4600	4600	4403	2799
1967	3510	4595	3787	4600	4285	4315	800	800	3000	4600	4600	4600	2623
1968	4600	4600	3074	1645	2169	2634	2240	1883	2404	4600	4600	4272	2345
1969	3631	4600	3787	4600	4285	3963	1500	1500	3000	4578	4600	4600	2692
1970	4600	3627	800	2242	1768	2614	2165	800	2006	2255	4600	4600	1937
1971	4402	4600	4600	4600	4479	4600	2747	2093	3000	4600	4600	4600	2952
1972	4600	4600	3743	4600	4600	4600	1659	800	3000	4600	4600	3959	2745
1973	3977	4600	3787	4600	4285	4315	1500	1500	2770	4600	4523	4600	2718
1974	4600	4600	3787	4600	4285	2923	800	800	2773	4600	4600	4600	2591
1975	4600	4600	3787	4600	3248	2643	1500	1500	3000	4600	4600	4600	2615
1976	4600	4600	3787	4600	1997	2145	1410	1281	800	800	1610	2864	1848
1977	2483	1590	800	2333	800	800	800	800	1504	2392	2908	2810	1213
1978	3065	1783	3444	4600	4600	2406	800	800	2922	4583	4600	4600	2302
1979	4600	4373	3747	3516	2509	2624	2723	1500	3000	4600	4037	4600	2528
1980	4600	3647	3787	4600	4600	3081	2050	800	2436	4583	4600	4600	2624
1981	4600	4091	3410	4600	3154	2624	2299	1125	2800	4600	4600	4191	2543
1982	3177	4600	3787	4600	4285	4315	1500	1500	3000	4600	4600	4600	2688
1983	4600	3452	800	1773	1329	1658	800	800	3000	4600	4600	4600	1937
1984	4600	1304	1171	1447	2258	2627	2760	1500	2354	3981	4600	4600	2011
1985	4600	4600	4600	4600	3612	2899	800	800	2037	4600	4600	4600	2559
1986	3087	2619	3787	4600	4285	4286	800	800	2380	3385	4600	4600	2366
1987	4600	4547	4213	4532	2855	1838	1752	1460	1908	1900	1861	3478	2108
1988	2468	3052	2974	4600	4600	800	1333	1430	800	802	1943	2964	1673
1989	2770	2523	2632	3411	1452	4600	2386	800	1858	3869	3936	3487	2045
1990	3247	3777	4312	4600	3436	2561	800	1150	800	800	1510	2467	1775
1991	2684	1414	1753	1545	800	4315	800	800	1229	1471	1420	4250	1362
1992	2935	1126	1855	2598	4600	3398	800	1416	800	800	1122	2733	1458
1993	3015	2531	3404	4600	4600	4600	1125	1125	3000	4561	4600	4600	2518
1994	4600	4600	2448	4600	4600	2529	800	800	1148	4600	4600	4341	2390
Avg.	**3812**	**3615**	**3231**	**3960**	**3371**	**2991**	**1543**	**1179**	**2315**	**3648**	**3893**	**4181**	**2279**
Min.	**1474**	**1126**	**644**	**540**	**717**	**600**	**800**	**800**	**800**	**600**	**600**	**2021**	**908**
Max.	**4600**	**4600**	**4600**	**4600**	**4600**	**4600**	**2947**	**2274**	**3000**	**4600**	**4600**	**4600**	**2952**

Table 3.2-3c. CALSIM II Simulated Change in CVP Tracy Pumping (cfs) for Existing Condition (2001 LOD) Compared with Proposed Action Conditions

Alt [EWA]—Base [EWA], Tracy Export (cfs)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1922	209	-1	373	368	346	-548	0	0	0	7	75	134	57
1923	263	352	379	1390	72	0	0	0	0	42	80	137	165
1924	48	-65	66	375	0	0	0	0	0	200	4	311	57
1925	537	-6	-18	89	382	-671	0	0	24	-41	7	191	28
1926	0	-43	0	379	365	38	0	0	90	140	273	-18	73
1927	94	382	388	386	376	-1103	0	0	10	42	80	137	45
1928	-10	353	379	375	359	-510	0	0	0	37	76	135	71
1929	34	-403	33	209	0	1	0	0	359	38	15	-100	12
1930	-169	297	390	387	-3	357	5	0	43	585	-884	-12	61
1931	-177	-1	214	62	250	0	0	0	-229	0	413	99	38
1932	85	-19	391	389	382	0	0	0	3	-7	-85	88	74
1933	353	973	32	50	61	0	0	0	0	0	0	0	88
1934	0	-1	132	-70	0	-130	0	0	0	0	0	-7	-5
1935	122	-88	46	387	138	145	0	-18	-7	-3	-1	265	59
1936	-67	-81	-133	383	0	29	0	0	12	215	-5	175	32
1937	-54	20	-1	378	363	-313	0	0	0	1	142	252	46
1938	241	373	9	-244	0	0	0	0	0	33	73	133	37
1939	261	-511	0	0	0	10	0	0	0	31	22	9	-10
1940	-2	-10	-4	377	362	345	0	0	0	276	91	143	95
1941	55	231	380	376	360	-722	0	0	0	46	83	138	55
1942	271	354	218	-1115	8	0	0	0	0	0	72	132	-5
1943	260	351	378	1261	714	12	0	0	10	39	78	136	194
1944	266	0	-44	375	359	-68	0	0	0	-240	-204	165	36
1945	62	363	382	378	364	-993	0	0	0	55	90	142	49
1946	232	357	380	376	-534	13	3	0	0	18	62	127	66
1947	56	348	377	373	354	28	0	0	27	23	-261	183	89
1948	-161	207	57	292	365	2	0	0	0	64	97	153	64
1949	285	-369	-12	1	22	355	-1	0	0	29	393	132	52
1950	-143	-319	316	374	356	154	0	0	3	3	137	242	67
1951	-51	372	385	-607	-911	0	0	0	0	40	79	136	-30
1952	267	-403	379	375	359	261	0	0	0	38	77	135	91
1953	265	353	-575	111	137	1	0	0	0	25	67	130	30
1954	255	349	378	373	355	-578	0	0	0	0	47	119	77
1955	73	343	376	371	-490	15	11	-6	0	633	490	-24	112
1956	123	88	384	380	368	-646	0	0	7	0	71	132	54
1957	259	350	594	1519	-3	0	1	0	0	0	45	118	176
1958	232	342	375	371	351	217	0	0	0	35	75	134	128
1959	263	352	-404	156	198	0	0	-7	11	-18	54	77	40
1960	417	92	7	247	354	73	0	0	28	148	-118	29	77
1961	-9	87	-1	5	374	-2	0	0	37	44	82	133	43

Table 3.2-3c. Continued

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1962	52	-48	5	36	358	324	0	0	0	46	83	-1	51
1963	271	355	379	375	358	-483	0	0	0	19	63	128	87
1964	251	348	377	373	-639	0	60	0	330	770	-318	-22	95
1965	146	19	383	379	365	-236	0	0	0	0	37	114	72
1966	224	340	375	370	286	329	0	0	0	48	85	-57	121
1967	122	350	379	376	359	279	0	0	0	55	90	142	129
1968	278	357	-712	81	97	0	-1	0	-1	1	49	-51	5
1969	0	344	376	371	352	-73	0	0	0	11	73	421	112
1970	1511	1752	0	131	93	0	1	0	-1	1	71	132	223
1971	62	351	378	374	235	320	0	0	0	6	53	122	114
1972	241	345	-64	372	354	325	7	0	0	58	93	-57	101
1973	-28	357	380	376	360	279	0	0	1	45	5	138	115
1974	270	354	379	375	358	-1114	0	0	8	48	85	139	52
1975	273	355	379	376	-994	-6	0	0	0	30	71	132	43
1976	259	351	378	374	-160	-619	-2	0	0	0	-72	-18	30
1977	144	-46	0	2	0	0	0	0	2	118	-18	0	13
1978	0	-15	47	388	379	-1010	0	0	6	0	61	127	-4
1979	249	121	9	-241	0	2	0	0	0	13	0	125	17
1980	246	-4	377	372	355	-1197	0	0	8	0	61	127	20
1981	249	66	432	2188	644	0	-5	0	-2	5	52	2	219
1982	-11	345	376	372	352	279	0	0	0	54	89	141	120
1983	277	-282	0	219	155	0	0	0	0	33	73	133	37
1984	261	-147	0	0	0	0	0	0	0	-3	58	125	18
1985	246	347	377	372	6	-44	0	0	-104	71	102	165	94
1986	-228	16	381	378	362	297	0	0	11	28	94	147	89
1987	282	305	0	309	-738	-44	-10	7	11	13	22	3	14
1988	-55	3	-7	381	369	0	-82	26	0	-258	-117	-9	14
1989	-31	375	1	19	291	383	1	0	4	-361	-216	25	28
1990	34	217	96	381	-249	3	0	5	0	0	-3	-57	27
1991	-7	34	-12	12	0	370	0	0	-1	45	-56	0	24
1992	0	-16	0	12	378	0	0	1	0	0	-773	16	-25
1993	0	189	0	379	365	325	0	0	0	6	82	138	88
1994	270	354	-166	375	358	0	0	0	-361	10	56	17	54
Avg.	**149**	**180**	**169**	**306**	**161**	**-76**	**0**	**0**	**5**	**48**	**26**	**99**	**64**
Min.	**-228**	**-511**	**-712**	**-1115**	**-994**	**-1197**	**-82**	**-18**	**-361**	**-361**	**-884**	**-100**	**-30**
Max.	**1511**	**1752**	**594**	**2188**	**714**	**383**	**60**	**26**	**359**	**770**	**490**	**421**	**223**

Table 3.2-4. Monthly Distribution of CVP Tracy Pumping for Existing Condition (2001 LOD) and Proposed Action Conditions

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (taf)
A. Existing Condition (2001 LOD) Pumping (cfs)													
min	1,352	999	612	490	717	600	800	800	800	600	600	2,028	
10%	2,532	1,649	1,294	1,730	1,251	1,504	800	800	875	852	1,547	2,891	
20%	3,018	2,352	2,395	3,239	2,168	2,178	800	800	1,571	1,743	3,301	3,604	
30%	3,226	2,992	2,911	3,748	2,378	2,591	800	800	1,879	3,476	4,343	4,245	
40%	3,619	3,658	3,386	4,214	3,552	2,647	1,125	800	2,352	4,416	4,497	4,403	
50%	4,135	4,074	3,406	4,221	3,920	3,133	1,500	1,125	2,574	4,545	4,511	4,457	
60%	4,322	4,242	3,408	4,223	3,928	3,950	1,527	1,129	2,895	4,555	4,519	4,462	
70%	4,331	4,246	3,410	4,225	3,940	4,036	1,818	1,500	3,000	4,564	4,525	4,465	
80%	4,340	4,249	3,869	4,226	4,235	4,036	2,346	1,500	3,000	4,570	4,529	4,468	
90%	4,351	4,252	4,219	4,228	4,242	4,274	2,668	1,906	3,000	4,586	4,544	4,473	
Max	4,391	4,260	4,225	4,232	4,251	4,280	2,947	2,274	3,000	4,600	4,563	4,486	
Avg	3,662	3,435	3,062	3,654	3,211	3,067	1,543	1,179	2,311	3,600	3,867	4,082	2,215
B. Proposed Action Pumping (cfs)													
min	1,474	1,126	644	540	717	600	800	800	800	600	600	2,021	
10%	2,522	1,713	1,351	1,935	1,354	1,440	800	800	904	830	1,450	2,876	
20%	2,967	2,484	2,433	3,285	2,122	2,139	800	800	1,585	1,974	3,155	3,601	
30%	3,188	3,039	2,843	4,110	2,525	2,545	800	800	1,888	3,830	4,188	4,304	
40%	3,686	3,703	3,394	4,600	3,229	2,633	1,125	800	2,352	4,530	4,600	4,599	
50%	4,258	3,914	3,787	4,600	4,285	2,899	1,500	1,125	2,627	4,583	4,600	4,600	
60%	4,600	4,600	3,787	4,600	4,285	3,331	1,528	1,130	2,904	4,600	4,600	4,600	
70%	4,600	4,600	3,787	4,600	4,296	3,871	1,818	1,500	3,000	4,600	4,600	4,600	
80%	4,600	4,600	3,853	4,600	4,600	4,273	2,344	1,500	3,000	4,600	4,600	4,600	
90%	4,600	4,600	4,600	4,600	4,600	4,600	2,669	1,906	3,000	4,600	4,600	4,600	
Max	4,600	4,600	4,600	4,600	4,600	4,600	2,947	2,274	3,000	4,600	4,600	4,600	
Avg	3,812	3,615	3,231	3,960	3,371	2,991	1,543	1,179	2,315	3,648	3,893	4,181	2,279
C. Change in Monthly Distribution (cfs)													
min	122	127	32	50	0	0	0	0	0	0	0	-7	
10%	-10	64	57	206	103	-64	0	0	28	-22	-97	-14	
20%	-51	132	38	47	-46	-39	0	0	14	230	-146	-3	
30%	-38	47	-68	362	146	-47	0	0	8	353	-155	59	
40%	67	45	8	386	-323	-14	0	0	0	114	103	197	
50%	123	-160	381	379	365	-234	0	0	54	38	89	143	
60%	278	358	379	377	357	-619	1	1	9	45	81	138	
70%	269	354	377	375	356	-166	0	0	0	36	75	135	
80%	260	351	-15	374	365	237	-2	0	0	30	71	132	
90%	249	348	381	372	358	326	1	0	0	14	56	127	
Max	209	340	375	368	349	320	0	0	0	0	37	114	
Avg	149	180	169	306	161	-76	0	0	5	48	26	99	64

The CVP water supply that can be pumped at the Tracy Pumping Plant would be slightly increased to 4,600 cfs by the Proposed Action. The monthly CALSIM II model cannot indicate the benefits of the Proposed Action during periods of routine maintenance or during emergency operations in the DMC or California Aqueduct that would be temporarily assisted with the Intertie connection between the two conveyance facilities.

Deliveries

Table 3.2-5 gives the simulated annual (water year) CVP south-of-Delta deliveries for the Existing Condition simulation and the Proposed Action. The annual changes in the CVP deliveries are also given in Table 3.2-5. The average annual total CVP delivery was 2,414 taf/yr for the simulated Existing Condition. The average annual total CVP delivery with the Proposed Action was increased by 34 taf/yr to 2,448 taf/yr for the simulated Existing Condition.

Figure 3.2-1 shows the 1922–1994 sequence of simulated CVP south-of-Delta deliveries for the simulated Existing Condition. As suggested in Figure 3.2-1, the simulated annual change in CVP south-of-Delta deliveries for the Existing Condition with Proposed Action is relatively small. The CVP water supply was greater than 80% of demand (3,332 taf) in about 40% of the years. The CVP delivery dropped below 2,000 taf (60% of demand) in about 20% of the years. The CVP delivery was less than 1,500 taf (45% of demand) in about 10% of the years. There are four drought sequences in the historical record, 1924–1926, 1929–1935, 1976–1977, and 1988–1992. All of these years have CVP south-of-Delta deliveries of less than 2,000 taf/yr.

The average change in CVP deliveries with the Proposed Action was an increase of 34 taf/yr at the 2001 LOD. The maximum annual change was 134 taf in 1958. The changes in CVP deliveries were greater than 30 taf in 40% of the years. This simulated increase in CVP deliveries is an average of about 1.5% of the average CVP deliveries. Even though Tracy pumping increased by 64 taf/yr at the 2001 LOD, deliveries increased by only 34 taf/yr because of reduced use of Banks Pumping Plant for CVP deliveries.

Changes in Central Valley Project Water Supply Pumping and Deliveries under No Action (2020 LOD)

This section identifies changes attributable to implementing the Proposed Action compared to No Action. This is accomplished by comparing the CALSIM II model results for the 2020 LOD with the Proposed Action (i.e., Proposed Action) and the 2020 LOD without the Proposed Action (i.e., No Action).

Pumping

Table 3.2-6 provides a summary of simulated monthly CVP Tracy Pumping for the No Action (2020 LOD). Comparing the simulated No Action level of pumping without the Proposed Action against that of a simulated No Action level of pumping with the Proposed Action, the annual average total change in distribution is 65 taf/yr.

Deliveries

Table 3.2-5 gives the simulated average annual CVP south-of-Delta deliveries for the No Action (2020 LOD) and Proposed Action. The simulated changes for No Action and Proposed Action CVP firm deliveries (no Section 215 deliveries are simulated) shown in Table 3.2-5 indicate an average annual increase in deliveries of 31 taf/yr.

Figure 3.2-1 shows the 1922–1994 sequence of simulated CVP south-of-Delta deliveries for the simulated No Action condition. As suggested in Figure 3.2-1, the simulated annual change in CVP south-of-Delta deliveries for No Action is relatively small.

Changes in State Water Project Water Supply Pumping and Deliveries under Existing Condition (2001 LOD)

This section identifies changes attributable to implementing the Proposed Action under the simulated 2001 LOD. This is accomplished by comparing the CALSIM II model results for 2001 with the Proposed Action (i.e., Proposed Action) and 2001 without the Proposed Action (i.e., Existing Condition).

Pumping

Tables 3.2-7a–c give the simulated monthly SWP Banks pumping for the 73-year period of CALSIM II simulation. Table 3.2-7a gives the simulated Existing Condition pumping arranged by water years, Table 3.2-7b gives the monthly simulations for the Proposed Action, and Table 3.2-7c gives the monthly differences for the 73-year period of simulation. The simulated Existing Condition annual (water year) SWP Banks pumping ranged from a minimum of 1,055 taf (in 1991) to a maximum of 4,281 taf (in 1982), with an average annual pumping of 3,241 taf/yr. SWP Banks pumping was generally the same with the Proposed Action and simulated Existing Condition in all months, although there was a slight decrease under the Proposed Action of 39 taf/yr in the average SWP pumping (Table 3.2-7c).

Table 3.2-8 shows the monthly cumulative distribution (i.e., sorted) of simulated SWP Banks pumping for the Existing Condition and for the Proposed Action. For the Existing Condition, the minimum October SWP pumping value was 578 cfs, the median (50%) value was 4,220 cfs, and the maximum value was 6,680 cfs. For the 2001 Existing Condition simulation during October there was a 20% probability that the SWP Banks pumping would be greater than 6,300 cfs and close to the maximum capacity of 6,680 cfs. The average simulated SWP pumping was reduced slightly in October from 4.127 cfs to 4.014 cfs with the Proposed Action. Pumping changes in other winter months were similar slight reductions.

The simulated SWP Banks pumping was not changed during the VAMP period in April and May because SWP pumping conditions are completely determined by the San Joaquin River inflow and the assumed VAMP export reductions that are simulated as part of the EWA actions. The allowance of 500 cfs of EWA

Table 3.2-5. CALSIM II-Simulated Average Annual Total CVP South of Delta Deliveries (taf) for Existing Condition (2001 LOD) and No Action (2020 LOD) Compared to the Proposed Action

	2001			2020		
Year	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Changes
1922	2865	2914	49	2879	2914	36
1923	2724	2706	-19	2700	2687	-13
1924	1490	1481	-9	1490	1481	-9
1925	2052	2113	61	2041	2067	26
1926	1862	1922	60	1831	1860	29
1927	2495	2522	27	2494	2509	15
1928	2724	2791	67	2659	2730	72
1929	1819	1862	44	1803	1856	53
1930	1908	1950	42	1908	1932	24
1931	1353	1379	26	1368	1373	5
1932	1217	1264	47	1258	1286	28
1933	1213	1225	12	1235	1243	8
1934	1326	1353	27	1324	1324	0
1935	1801	1818	17	1774	1776	3
1936	2333	2339	6	2221	2226	5
1937	2115	2117	2	2047	2035	-12
1938	2624	2624	0	2614	2610	-3
1939	2586	2590	4	2556	2559	3
1940	2529	2601	72	2340	2425	84
1941	2663	2689	26	2681	2738	57
1942	2773	2774	2	2902	2912	10
1943	2750	2751	2	2783	2756	-27
1944	2457	2494	37	2372	2423	50
1945	2559	2583	24	2543	2559	16
1946	2793	2799	6	2779	2784	5
1947	2478	2483	5	2388	2425	37
1948	2429	2476	47	2467	2500	33
1949	2704	2700	-4	2537	2589	52
1950	2249	2263	14	2153	2171	18
1951	2538	2545	7	2544	2550	6
1952	2721	2814	93	2721	2814	93
1953	2814	2840	26	2803	2829	26
1954	2903	2955	52	2906	2997	91
1955	2415	2495	80	2360	2418	58
1956	2660	2678	18	2558	2561	3
1957	2987	2986	-1	2954	2953	-2

Table 3.2-5. Continued

	2001			2020		
Year	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Changes
1958	2817	2951	134	2718	2858	140
1959	2865	2906	41	2814	2856	41
1960	2082	2107	26	2064	2092	28
1961	2493	2532	39	2451	2407	-43
1962	2660	2709	49	2658	2659	1
1963	2823	2838	15	2750	2832	82
1964	2455	2526	72	2439	2505	66
1965	2903	2924	22	2879	2912	33
1966	2744	2856	112	2734	2843	109
1967	2612	2712	100	2611	2711	100
1968	2889	2913	24	2899	2921	23
1969	2816	2885	69	2813	2883	70
1970	2665	2689	24	2627	2651	25
1971	2915	2937	22	2888	2914	26
1972	2668	2801	133	2719	2812	93
1973	2657	2755	98	2649	2765	116
1974	2670	2696	26	2723	2749	26
1975	2774	2776	2	2790	2790	0
1976	1875	1932	57	1865	1892	27
1977	1358	1368	10	1336	1331	-4
1978	2541	2536	-5	2504	2502	-3
1979	2920	2920	0	2920	2923	3
1980	2898	2901	3	2738	2798	60
1981	2951	2951	0	2901	2918	17
1982	2676	2791	115	2681	2797	116
1983	2743	2775	32	2744	2777	33
1984	2838	2841	3	2840	2843	3
1985	2517	2582	64	2516	2578	63
1986	2530	2627	98	2532	2632	100
1987	2236	2259	23	2277	2204	-74
1988	1717	1710	-7	1744	1711	-33
1989	1999	2020	21	1997	2010	12
1990	1579	1585	7	1577	1581	4
1991	1410	1410	0	1414	1414	0
1992	1874	1892	18	1754	1754	0
1993	2537	2581	44	2393	2472	78
1994	2613	2609	-4	2565	2602	37

Table 3.2-5. Continued

	2001			2020		
Year	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Changes
Avg.	**2414**	**2448**	**34**	**2391**	**2422**	**31**
Min.	**1213**	**1225**	**-19**	**1235**	**1243**	**-74**
Max.	**2987**	**2986**	**134**	**2954**	**2997**	**140**
Percentile Distribution						
min	1,213	1,225	-19	1,235	1,243	-74
10%	1,606	1,610	0	1,611	1,607	-4
20%	1,944	1,978	2	1,944	1,963	0
30%	2,382	2,421	7	2,315	2,335	5
40%	2,513	2,535	18	2,464	2,501	14
50%	2,586	2,609	24	2,544	2,578	26
60%	2,663	2,701	28	2,651	2,692	30
70%	2,724	2,776	45	2,720	2,780	45
80%	2,806	2,839	61	2,781	2,831	65
90%	2,884	2,914	91	2,879	2,912	93
max	2,987	2,986	134	2,954	2,997	140

Table 3.2-6. Monthly Distribution of CVP Tracy Pumping for No Action (2020 LOD) and Proposed Action Conditions

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (taf)
A. No Action (2020 LOD) Pumping (cfs)													
min	1,489	1,170	640	533	734	600	800	800	800	600	600	2,094	
10%	2,443	1,876	1,318	1,656	1,549	1,632	800	800	930	834	1,517	2,921	
20%	2,995	2,460	2,003	2,852	2,207	2,198	800	800	1,550	2,067	2,710	3,505	
30%	3,176	2,988	2,725	4,052	2,531	2,504	800	800	1,819	3,301	4,343	4,186	
40%	3,496	3,520	3,217	4,217	3,639	2,638	800	800	2,300	3,995	4,501	4,387	
50%	3,981	4,053	3,403	4,220	3,917	3,224	1,500	1,125	2,518	4,545	4,512	4,452	
60%	4,323	4,237	3,408	4,223	3,926	3,968	1,641	1,168	2,892	4,551	4,517	4,460	
70%	4,331	4,245	3,410	4,225	3,940	4,036	1,881	1,500	3,000	4,560	4,522	4,464	
80%	4,339	4,248	3,776	4,226	4,235	4,068	2,388	1,500	3,000	4,567	4,527	4,467	
90%	4,349	4,253	4,216	4,228	4,242	4,272	2,733	1,873	3,000	4,588	4,544	4,474	
Max	4,391	4,260	4,225	4,232	4,251	4,286	2,947	2,274	3,000	4,600	4,561	4,485	
Avg	3,633	3,471	2,962	3,667	3,261	3,063	1,535	1,189	2,296	3,564	3,794	4,071	2,207
B. Proposed Action Pumping (cfs)													
min	1,594	1,171	661	566	734	600	800	800	800	600	600	2,096	
10%	2,183	1,720	1,522	1,908	1,461	1,446	800	800	1,106	843	1,439	2,922	
20%	2,956	2,532	2,194	3,437	2,215	1,763	800	800	1,573	2,065	2,759	3,635	
30%	3,170	3,023	2,879	4,318	2,640	2,424	800	800	1,841	3,289	4,283	4,209	
40%	3,559	3,660	3,640	4,600	3,664	2,635	800	800	2,306	4,063	4,583	4,548	
50%	4,097	4,194	3,787	4,600	4,234	2,819	1,500	1,125	2,519	4,567	4,600	4,600	
60%	4,418	4,589	3,787	4,600	4,285	3,364	1,647	1,167	2,889	4,600	4,600	4,600	
70%	4,600	4,600	3,787	4,600	4,285	3,682	1,912	1,500	3,000	4,600	4,600	4,600	
80%	4,600	4,600	3,856	4,600	4,429	4,308	2,386	1,500	3,000	4,600	4,600	4,600	
90%	4,600	4,600	4,600	4,600	4,600	4,543	2,733	1,872	3,000	4,600	4,600	4,600	
Max	4,600	4,600	4,600	4,600	4,600	4,600	2,947	2,274	3,000	4,600	4,600	4,600	
Avg	3,737	3,634	3,268	4,001	3,435	2,953	1,538	1,188	2,304	3,573	3,821	4,179	2,272
C. Change in Monthly Distribution (cfs)													
min	105	1	21	32	0	0	0	0	0	0	0	2	
10%	-260	-156	204	252	-89	-186	0	0	176	9	-79	1	
20%	-40	71	192	585	8	-435	0	0	23	-2	49	130	
30%	-6	34	153	266	109	-80	0	0	22	-12	-60	24	
40%	63	140	422	383	25	-3	0	0	6	68	83	161	
50%	116	141	384	380	318	-405	0	0	1	22	88	148	
60%	95	352	379	377	359	-605	6	-1	-3	49	83	140	
70%	269	355	377	375	345	-355	31	0	0	40	78	136	
80%	261	352	80	374	193	240	-2	0	0	33	73	133	
90%	251	347	384	372	358	271	0	-1	0	12	56	126	
Max	209	340	375	368	349	314	0	0	0	0	39	115	
Avg	104	162	305	334	174	-110	3	-1	7	8	27	108	65

Table 3.2-7a. CALSIM Simulated SWP Banks Pumping (cfs) for Existing Condition (2001 LOD)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1922	3093	2877	4467	7612	8500	7561	3412	3637	6680	4439	6677	6269	3922
1923	5345	5251	4599	8500	5751	3426	2977	2470	3416	6496	6427	5604	3637
1924	3333	2461	5300	5348	3580	300	300	300	2405	300	3870	1673	1759
1925	2271	2451	2905	3659	5651	300	2857	2334	2275	2017	6395	4241	2240
1926	2426	1101	1968	5301	5232	1494	2634	1791	3029	5979	3934	4396	2362
1927	3396	6680	4415	7269	8218	6712	3432	3637	5669	2221	6680	5714	3846
1928	2841	6680	7067	7406	6368	7561	3032	700	3825	1820	7180	5728	3626
1929	3315	3552	4064	4919	3574	1563	700	300	963	3605	682	1825	1752
1930	1081	1351	5118	5272	3432	5168	1636	1673	2527	6649	5133	4569	2641
1931	812	2002	2153	4044	1747	830	300	560	1299	4180	4279	1848	1458
1932	1614	1305	4493	5816	6168	3679	300	2177	300	1715	5758	4457	2274
1933	2194	3468	2219	7220	2222	4914	700	918	300	2519	649	1350	1738
1934	1594	300	4333	4431	5651	1049	300	300	314	2571	1224	2923	1495
1935	1835	3177	2837	5864	4194	7256	3432	324	5829	7149	6594	4817	3219
1936	5077	2483	3857	7302	8437	7561	2887	2394	5495	5145	6486	4980	3737
1937	4766	1680	3927	6164	8500	7561	3432	3195	334	6862	6725	4896	3498
1938	3683	6680	4117	8500	8500	6494	3032	3274	6680	3737	6680	7180	4118
1939	6680	6323	7039	5700	3051	4130	316	1900	2606	7116	6814	5687	3479
1940	3751	2435	3260	5967	8437	7561	3432	3075	4033	7180	6564	5202	3664
1941	3141	2929	7195	8449	8500	7165	3032	3274	2432	3861	6680	7180	3844
1942	6680	6127	6863	5875	2816	6629	3432	3637	6680	3814	6680	7180	4020
1943	6680	6680	7323	7259	5814	5722	3032	2314	5113	2638	6854	6115	3954
1944	4345	1796	3468	6510	4871	5006	2155	2170	4029	7180	7180	6429	3333
1945	3629	6653	4415	5653	8500	7113	2060	2267	4500	7180	6569	5452	3847
1946	4824	5650	5704	8250	1660	5911	2407	2595	4175	7180	7180	6680	3778
1947	4407	4267	4433	4659	5419	4174	1798	300	2360	7180	6627	5025	3055
1948	3335	3481	2423	4966	2109	3133	2981	3274	5513	7180	7141	6287	3138
1949	4079	2898	3909	3289	2931	5269	1831	2005	2957	5592	4046	4723	2634
1950	1339	1355	1657	5456	7593	4271	2394	2330	5837	7180	6946	5759	3129
1951	4890	6680	4655	8500	7074	6866	2180	2679	2659	5491	7180	6388	3934
1952	4220	4805	7194	8500	8437	4344	3365	1500	6277	5481	6421	7180	4071
1953	6680	5528	5431	2679	5534	7190	2375	3309	6680	3856	6680	7180	3805
1954	6093	6680	5917	7241	7430	7104	3232	1125	2850	5642	7180	6680	4048
1955	4916	5872	6975	7299	1899	2050	1150	1769	3176	4705	873	3673	2689
1956	1395	4089	4655	6320	7528	6713	2517	3274	6680	4511	6680	7180	3699
1957	6680	3962	3282	7266	7597	7366	2698	2521	4232	5295	5769	6042	3777
1958	6680	6115	4404	7343	7823	6599	3432	3637	6680	4771	6170	7180	4262
1959	6680	4727	5735	7362	3604	1337	1810	2030	4561	7037	6817	6167	3502
1960	4816	1944	3071	4718	4744	4717	300	1747	2312	6179	2316	2796	2396
1961	1383	3022	4235	3736	7141	3135	1651	300	2211	6016	6432	5262	2671

Table 3.2-7a. Continued

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1962	3501	3555	4308	2536	8500	7137	2040	508	4727	6625	6680	6565	3401
1963	6680	6680	4376	7294	7765	7125	3032	3274	6121	1971	6680	6417	4055
1964	6467	6680	4551	7234	2023	2103	2180	700	3026	7180	6680	6680	3364
1965	4071	4971	5513	8500	8500	5100	3432	2298	3389	3413	6985	6491	3766
1966	2677	6680	7642	8286	4811	6897	1125	2244	3478	6788	6527	5389	3784
1967	4202	6427	4480	7763	7742	5932	3032	3274	6680	7180	7180	7180	4278
1968	6680	6046	6266	5342	5727	5728	2240	1883	2405	4841	7180	5535	3615
1969	4615	4344	4417	8500	8500	4927	3432	3637	6287	3737	4509	7180	3848
1970	6680	6680	7302	5624	6246	5795	2164	1961	4418	4294	6260	6680	3865
1971	3988	6680	7121	7465	1844	7227	2850	3420	5197	6281	6680	7180	4000
1972	6568	5059	3808	7252	6121	6956	1652	1661	2093	5901	6097	4301	3471
1973	3394	6680	4385	7483	8106	6718	2822	2930	5309	4439	6484	5511	3863
1974	5180	6680	4423	8500	7833	6732	3032	3147	6680	3896	6680	7180	4209
1975	6680	6064	7017	7336	8066	3118	3307	3637	5774	4458	6680	7180	4170
1976	6680	6680	7011	5966	3015	2764	1412	1281	1918	4101	6892	5491	3223
1977	3192	3077	2177	2331	994	922	300	694	1449	346	3380	1527	1235
1978	578	1228	4133	5889	8500	7389	700	3274	6575	2395	6677	7180	3271
1979	5266	2256	1039	8347	4628	7561	2723	2810	4591	5897	6025	4974	3394
1980	3587	4323	4411	8500	8437	7298	2603	2521	5683	4329	6680	7180	3941
1981	5785	1949	4566	7378	4268	7273	2304	1125	2803	7180	6680	5378	3436
1982	4709	6680	4404	8500	8500	6992	3432	3637	6680	3823	6680	7180	4281
1983	6680	6680	7678	2941	2694	2570	2848	3015	4126	7180	7180	7180	3679
1984	5344	3248	2106	5634	5563	5804	2760	2451	2830	3858	7180	6516	3213
1985	5125	6680	7039	6380	3605	2943	700	1900	3414	7180	7021	6680	3551
1986	4628	4330	4403	7408	8500	7561	3017	2336	5507	1941	6679	6669	3783
1987	5227	1527	2207	5413	4309	3830	1762	300	3919	7180	6468	5109	2855
1988	2253	1862	2981	7106	2108	411	1415	1404	594	3017	415	1355	1510
1989	831	2645	2631	3392	1050	5150	2384	700	3961	7180	6680	5065	2528
1990	4971	1744	4249	5253	3779	2558	300	1145	331	509	4228	1848	1870
1991	932	1322	1414	1420	743	4629	700	700	397	3301	389	1398	1055
1992	1312	962	1655	2586	5486	3398	700	1415	300	2881	948	3319	1492
1993	876	300	3747	6320	8445	7416	3232	3455	6666	3484	6620	5390	3359
1994	5914	2157	5005	6464	5370	1011	1554	1317	3320	6680	6824	6644	3154
Avg.	**4127**	**4115**	**4514**	**6219**	**5589**	**5012**	**2194**	**2097**	**3843**	**4837**	**5782**	**5417**	**3241**
Min.	**578**	**300**	**1039**	**1420**	**743**	**300**	**300**	**300**	**300**	**300**	**389**	**1350**	**1055**
Max.	**6680**	**6680**	**7678**	**8500**	**8500**	**7561**	**3432**	**3637**	**6680**	**7180**	**7180**	**7180**	**4281**

Table 3.2-7b. CALSIM II Simulated SWP Banks Pumping (cfs) for Proposed Action at the Existing Condition

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1922	3093	2877	4607	7612	8500	7561	3412	3637	6680	1662	6677	6376	3766
1923	5156	5174	4741	8500	5666	3269	2979	2470	3415	6493	6494	5465	3611
1924	3432	2437	5300	4973	3580	300	300	300	2403	300	3834	1626	1735
1925	1692	2494	2887	3748	4961	300	2869	2347	1118	2047	5962	4056	2070
1926	2427	1080	1968	5207	5299	1484	2635	1792	3305	5998	4487	4983	2445
1927	3343	6680	4561	7270	8217	6721	3432	3637	5699	2189	6680	5577	3844
1928	2843	6680	7067	7406	5955	6889	3032	700	3825	2269	7057	5676	3579
1929	3314	3551	4130	4603	3575	1563	700	300	928	3397	779	1786	1725
1930	1050	1317	4605	5175	3429	5079	1641	1676	2974	6802	5260	4580	2639
1931	669	2237	2222	4105	1747	828	300	576	1287	3822	4272	1725	1441
1932	1569	1315	4640	5719	5804	3666	300	2177	300	1734	5671	2811	2152
1933	2250	1992	2429	7221	2240	4913	700	928	300	2519	649	1350	1668
1934	1594	300	4341	4284	5651	1048	300	300	313	2583	1078	2754	1468
1935	1806	3132	2883	5767	4055	7256	3432	324	5842	7152	6277	4617	3173
1936	5098	2477	3804	7302	8437	7561	2888	2400	5532	5155	6293	4834	3717
1937	4754	1697	3925	5765	8500	7561	3432	3194	334	6821	6814	4641	3461
1938	3541	6680	4120	8500	8500	6494	3032	3274	6680	3737	6680	7180	4110
1939	6680	6680	7039	5700	3051	4120	316	1900	2573	7113	6816	5660	3496
1940	3746	2441	3252	5873	8437	7561	3432	3075	3977	7180	6609	5061	3649
1941	2896	2892	7195	8450	8500	7214	3032	3274	2434	3838	6680	7180	3828
1942	6680	5773	7305	5149	2818	6629	3432	3637	6680	947	6680	7180	3806
1943	6680	6680	7323	8500	5814	5722	3032	2308	5143	2905	6850	5979	4040
1944	4059	1774	3699	6134	5006	4941	2155	2171	4030	7180	7180	6494	3312
1945	3653	6263	4558	5015	8500	7561	2059	2266	4541	7180	6595	5266	3815
1946	4062	5909	5609	8250	1582	5907	2410	2595	4175	7180	7180	6680	3736
1947	4028	3936	4520	3691	5156	4138	1798	300	2764	7172	5733	4836	2899
1948	3137	3301	2402	4513	1744	3136	2984	3274	5533	7180	7073	6266	3062
1949	3333	2890	3897	3290	2954	5181	1830	2005	3264	6050	4450	4597	2647
1950	673	2326	2518	5362	7593	4117	2393	2287	5844	7180	7180	5474	3179
1951	4876	6680	4799	8500	7032	6836	2180	2679	2659	5359	7180	6321	3926
1952	4244	4755	7194	8500	8437	4342	3365	1500	6277	5464	6376	7180	4066
1953	6680	5374	5155	2707	5426	7190	2375	3309	6680	3603	6680	7180	3759
1954	5842	6680	5423	7241	7430	6689	3232	1125	2850	5448	7180	6680	3964
1955	4915	5058	6976	7299	1902	2045	1140	1762	3176	4304	951	3620	2616
1956	1464	3692	4799	6225	7509	6713	2517	3274	6680	2342	6680	7180	3548
1957	6680	3660	2589	7203	7597	7366	2699	2521	4040	4740	5920	5420	3639
1958	6680	5914	4545	7343	7823	6597	3432	3637	6680	4757	6129	7180	4256
1959	6680	4378	6143	7363	3674	1320	1810	2023	4553	7062	6709	5732	3478
1960	4623	1768	3124	4475	4877	4644	300	1746	2605	5639	2194	2810	2342
1961	1318	3061	4219	3741	7142	3136	1651	300	2599	5923	6401	5041	2671

Table 3.2-7b. Continued

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1962	3399	3553	4281	2536	8500	6815	2040	508	4727	6447	6680	6536	3361
1963	6680	6680	4518	7229	7766	7125	3032	3274	6121	2102	6680	5983	4042
1964	6240	6680	4180	7234	2023	2338	2240	700	2753	7180	6775	6680	3335
1965	3707	4956	5418	8500	8500	4751	3432	2282	3390	3311	6956	6434	3703
1966	2369	6680	7642	8286	4537	6569	1125	2244	3452	6867	6571	5435	3738
1967	4165	6187	4622	7762	7744	6041	3032	3274	6680	7180	7180	7180	4277
1968	6680	5717	6301	5342	5727	5723	2240	1883	2404	4830	7146	5484	3592
1969	4590	4046	4558	8500	8500	4907	3432	3637	6289	825	4600	7180	3663
1970	6680	6680	7302	5627	6208	5791	2165	1961	4417	4300	6258	6680	3863
1971	3782	6680	7121	7465	349	7227	2849	3419	5197	6284	6680	7180	3904
1972	6216	5204	3743	7252	5769	6956	1659	1661	2321	5686	5818	4358	3422
1973	3427	6680	4528	7483	8500	6721	2822	2929	5311	4235	6358	5376	3867
1974	4904	6680	4565	8500	8248	6732	3032	3147	6680	3354	6680	7180	4190
1975	6680	5780	7015	6979	8058	3117	3307	3637	5694	4476	6680	7180	4127
1976	6680	6680	7011	5593	2953	2764	1410	1281	1754	4827	6882	5509	3232
1977	3168	2961	2204	2333	994	1003	300	700	1454	343	3431	1527	1237
1978	580	1229	4139	5792	8500	7308	700	3274	6574	1427	6677	7128	3197
1979	5376	2163	1077	8348	4628	7561	2723	2810	4580	5892	6015	4849	3389
1980	3490	4223	4552	8500	8437	6987	2604	2523	5708	1410	6680	7104	3736
1981	5656	1944	4292	7378	4429	7273	2299	1125	2800	7180	6646	5132	3402
1982	4638	6680	4546	8500	8500	7203	3432	3637	6680	3800	6680	7180	4297
1983	6680	6680	7678	2941	2694	2570	2848	3015	4126	7180	7180	7180	3679
1984	4755	3248	2106	5634	5563	5804	2760	2451	2830	3875	7180	6535	3179
1985	4879	6680	7039	5409	3612	2899	700	1897	3521	7180	7082	6680	3484
1986	4730	4231	4546	7408	8500	7561	3016	2336	5540	1557	6679	6522	3762
1987	4947	1252	2172	5145	4310	3814	1752	300	3964	7180	6533	4929	2798
1988	2247	1873	2974	7106	1740	411	1333	1430	677	3142	592	1393	1511
1989	858	2565	2632	3411	1048	5054	2386	700	3973	7180	6680	5126	2525
1990	4969	1801	4312	4853	3814	2561	300	1150	333	339	4215	1824	1842
1991	929	1319	1397	1438	735	4768	700	700	390	3325	389	1431	1065
1992	1347	922	1655	2598	5391	3398	700	1416	300	3181	799	3613	1514
1993	736	300	3681	6225	8445	7416	3232	3455	6660	2534	6616	6009	3319
1994	5583	2157	4608	5541	5242	1014	1554	1317	3681	6809	6871	6945	3096
Avg.	**4014**	**4043**	**4533**	**6117**	**5535**	**4983**	**2193**	**2097**	**3859**	**4601**	**5771**	**5350**	**3201**
Min.	**580**	**300**	**1077**	**1438**	**349**	**300**	**300**	**300**	**300**	**300**	**389**	**1350**	**1065**
Max.	**6680**	**6680**	**7678**	**8500**	**8500**	**7561**	**3432**	**3637**	**6680**	**7180**	**7180**	**7180**	**4297**

Table 3.2-7c. CALSIM II Simulated Change in SWP Banks Pumping (cfs) for Existing Condition (2001 LOD) Compared with the Proposed Action

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1922	0	-1	140	0	0	0	0	0	0	-2777	0	106	-156
1923	-189	-76	142	0	-84	-157	2	0	-1	-3	67	-138	-26
1924	99	-24	0	-376	0	0	0	0	-1	0	-35	-47	-24
1925	-580	43	-18	89	-690	0	12	13	-1157	30	-433	-185	-170
1926	1	-21	0	-94	67	-10	1	1	276	18	552	588	83
1927	-53	0	146	0	-1	9	0	0	30	-32	0	-137	-2
1928	1	0	0	0	-414	-672	0	0	0	449	-123	-53	-47
1929	-1	-1	66	-316	0	0	0	0	-35	-208	96	-39	-27
1930	-31	-33	-513	-97	-3	-89	5	3	448	153	127	11	-2
1931	-142	236	68	62	0	-2	0	16	-12	-358	-7	-122	-16
1932	-45	10	147	-97	-363	-13	0	0	0	19	-86	-1645	-122
1933	55	-1476	210	0	18	0	0	10	0	0	0	0	-70
1934	0	0	9	-146	0	0	0	0	-1	12	-146	-170	-27
1935	-29	-45	46	-97	-138	0	0	0	13	4	-317	-201	-46
1936	21	-5	-53	0	0	0	2	5	37	10	-193	-146	-20
1937	-12	17	-1	-399	0	0	0	-1	0	-41	89	-255	-37
1938	-142	0	3	0	0	0	0	0	0	0	0	0	-9
1939	0	357	0	0	0	-10	0	0	-33	-4	2	-27	17
1940	-6	6	-8	-94	0	0	0	0	-56	0	46	-141	-15
1941	-245	-37	0	1	0	49	0	0	2	-23	0	0	-16
1942	0	-354	442	-725	2	0	0	0	0	-2866	0	0	-215
1943	0	0	0	1241	0	0	0	-6	30	267	-4	-136	86
1944	-287	-22	231	-376	135	-65	0	0	1	0	0	66	-20
1945	24	-390	143	-638	0	448	0	0	41	0	25	-185	-32
1946	-762	258	-95	0	-78	-5	3	0	0	0	0	0	-42
1947	-379	-332	87	-968	-263	-36	0	0	404	-8	-894	-188	-157
1948	-198	-180	-21	-453	-365	2	4	0	20	0	-67	-21	-76
1949	-747	-8	-12	1	22	-89	-1	0	307	458	404	-126	13
1950	-665	971	861	-93	0	-154	-1	-43	8	0	234	-285	50
1951	-13	0	144	0	-42	-30	0	0	0	-131	0	-67	-8
1952	23	-50	0	0	0	-2	0	0	0	-16	-45	0	-5
1953	0	-154	-276	28	-108	0	0	0	0	-254	0	0	-46
1954	-252	0	-494	0	0	-415	0	0	0	-195	0	0	-83
1955	-1	-813	0	0	4	-6	-9	-6	0	-401	78	-53	-73
1956	68	-397	144	-95	-20	0	0	0	0	-2169	0	0	-151
1957	0	-302	-693	-64	0	0	1	0	-192	-555	151	-622	-138
1958	0	-201	141	0	0	-3	0	0	0	-14	-42	0	-7
1959	0	-349	408	2	70	-17	0	-7	-8	25	-107	-436	-25
1960	-193	-176	53	-242	133	-73	0	-2	293	-540	-122	15	-54
1961	-65	38	-15	5	1	1	0	0	389	-93	-32	-221	0

Table 3.2-7c. Continued

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total (taf)
1962	-102	-2	-27	0	0	-323	0	0	1	-178	0	-29	-40
1963	0	0	142	-65	1	0	0	0	0	132	0	-434	-13
1964	-227	0	-371	0	0	235	60	0	-273	0	95	0	-29
1965	-364	-15	-95	0	0	-349	0	-15	0	-102	-29	-57	-63
1966	-308	0	0	0	-274	-329	0	0	-26	79	44	46	-46
1967	-37	-239	142	0	2	108	0	0	0	0	0	0	-1
1968	0	-328	36	0	0	-5	-1	0	-1	-11	-34	-51	-24
1969	-25	-298	141	0	0	-21	0	0	1	-2912	92	0	-185
1970	0	0	0	3	-38	-4	1	0	-2	6	-2	0	-2
1971	-206	0	0	0	-1495	0	-1	-1	0	3	0	0	-96
1972	-352	146	-64	0	-352	0	7	0	228	-215	-279	56	-50
1973	32	0	143	0	394	4	1	-1	2	-204	-126	-135	5
1974	-275	0	142	0	415	0	0	0	0	-541	0	0	-18
1975	0	-284	-2	-357	-8	-2	0	0	-80	19	0	0	-43
1976	0	0	0	-373	-62	0	-2	0	-164	726	-10	17	9
1977	-24	-116	27	2	0	81	0	6	5	-3	51	0	2
1978	2	0	6	-97	0	-81	0	0	-1	-969	0	-52	-73
1979	110	-93	37	0	0	0	0	0	-11	-5	-10	-125	-5
1980	-97	-100	141	0	0	-311	1	1	25	-2920	0	-76	-205
1981	-128	-5	-274	0	161	0	-5	0	-2	0	-34	-245	-33
1982	-70	0	141	0	0	211	0	0	0	-23	0	0	16
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	-589	0	0	0	0	0	0	0	0	17	0	20	-34
1985	-247	0	0	-972	6	-44	0	-2	108	0	62	0	-67
1986	102	-99	143	0	0	0	0	-1	33	-384	0	-147	-21
1987	-280	-275	-35	-268	1	-17	-10	0	45	0	65	-180	-58
1988	-6	11	-7	0	-369	0	-82	26	83	125	178	38	2
1989	27	-80	1	19	-2	-96	1	0	12	0	0	61	-3
1990	-2	57	63	-399	35	3	0	5	2	-170	-13	-25	-28
1991	-4	-2	-17	18	-8	139	0	0	-7	23	0	33	11
1992	36	-40	0	12	-94	0	0	1	0	300	-149	294	22
1993	-140	0	-65	-95	0	0	0	0	-6	-950	-4	618	-41
1994	-331	1	-397	-924	-128	3	0	0	361	129	47	301	-58
Avg.	**-113**	**-72**	**19**	**-102**	**-54**	**-29**	**0**	**0**	**16**	**-237**	**-11**	**-68**	**-39**
Min.	**-762**	**-1476**	**-693**	**-972**	**-1495**	**-672**	**-82**	**-43**	**-1157**	**-2920**	**-894**	**-1645**	**-215**
Max.	**110**	**971**	**861**	**1241**	**415**	**448**	**60**	**26**	**448**	**726**	**552**	**618**	**86**

Table 3.2-8. Monthly Distribution of SWP Banks Pumping for Existing Condition (2001 LOD) and Proposed Action

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (taf)
A. Existing Condition (2001 LOD) Pumping (cfs)													
min	578	300	1,039	1,420	743	300	300	300	300	300	389	1,350	
10%	1,348	1,352	2,183	3,446	2,040	1,368	393	518	668	2,058	2,529	2,038	
20%	2,260	1,946	3,017	4,938	3,030	2,835	1,135	1,001	2,290	3,131	4,759	4,420	
30%	3,266	2,474	3,888	5,439	4,028	3,770	1,718	1,466	2,638	3,819	6,341	5,007	
40%	3,621	3,157	4,296	5,873	5,160	4,874	2,162	1,896	3,146	4,272	6,518	5,390	
50%	4,220	4,089	4,411	6,380	5,651	5,722	2,394	2,244	3,919	4,771	6,677	5,714	
60%	4,818	4,989	4,482	7,253	6,509	6,605	2,772	2,405	4,435	5,693	6,680	6,307	
70%	5,199	6,084	5,051	7,339	7,751	6,921	2,995	2,858	5,383	6,548	6,680	6,654	
80%	6,318	6,680	6,126	7,561	8,437	7,180	3,032	3,274	5,834	7,136	6,842	7,180	
90%	6,680	6,680	7,062	8,500	8,500	7,410	3,432	3,448	6,680	7,180	7,180	7,180	
Max	6,680	6,680	7,678	8,500	8,500	7,561	3,432	3,637	6,680	7,180	7,180	7,180	
Avg	4,127	4,115	4,514	6,219	5,589	5,012	2,194	2,097	3,843	4,837	5,782	5,417	3,241
B. Proposed Action Pumping (cfs)													
min	580	300	1,077	1,438	349	300	300	300	300	300	389	1,350	
10%	1,321	1,318	2,240	3,439	1,762	1,492	354	515	703	1,567	2,317	1,917	
20%	2,248	1,954	2,905	4,531	2,973	2,942	1,128	967	2,403	2,377	4,732	4,402	
30%	3,147	2,482	3,832	5,185	3,886	3,905	1,766	1,548	2,757	3,315	6,049	4,873	
40%	3,455	3,089	4,244	5,660	4,979	4,824	2,171	1,899	3,280	3,828	6,438	5,310	
50%	4,043	3,814	4,536	6,179	5,659	5,723	2,402	2,255	3,968	4,748	6,661	5,543	
60%	4,693	5,017	4,564	7,232	6,702	6,585	2,797	2,430	4,491	5,569	6,680	6,163	
70%	4,938	5,870	4,799	7,357	7,759	6,790	3,007	2,893	5,466	6,398	6,680	6,536	
80%	6,141	6,680	6,270	7,732	8,437	7,201	3,032	3,274	5,844	7,145	6,843	7,123	
90%	6,680	6,680	7,116	8,500	8,500	7,411	3,432	3,452	6,680	7,180	7,177	7,180	
Max	6,680	6,680	7,678	8,500	8,500	7,561	3,432	3,637	6,680	7,180	7,180	7,180	
Avg	4,014	4,043	4,533	6,117	5,535	4,983	2,193	2,097	3,859	4,601	5,771	5,350	3,201
C. Change in Monthly Distribution (cfs)													
min	2	0	37	18	-395	0	0	0	0	0	0	0	
10%	-26	-34	57	-7	-278	124	-38	-3	35	-491	-211	-121	
20%	-13	8	-112	-407	-56	107	-7	-34	113	-754	-26	-18	
30%	-119	8	-56	-254	-142	135	48	82	119	-504	-292	-133	
40%	-166	-68	-52	-212	-181	-51	9	2	134	-443	-80	-80	
50%	-177	-276	126	-201	8	0	8	11	49	-23	-16	-171	
60%	-124	29	81	-21	193	-20	25	25	57	-124	0	-144	
70%	-261	-214	-251	18	8	-131	12	35	82	-149	0	-119	
80%	-177	0	143	172	0	20	0	0	10	9	1	-57	
90%	0	0	54	0	0	1	0	3	0	0	-3	0	
Max	0	0	0	0	0	0	0	0	0	0	0	0	
Avg	-113	-72	19	-102	-54	-29	0	0	16	-237	-11	-68	-39

wheeling in July–September was included in the simulated Existing Condition assumptions, but pumping above 6,680 cfs was simulated in only about 20% of the years. The largest simulated reductions were in July.

Deliveries

Table 3.2-9 shows the annual (water year) SWP south-of-Delta firm deliveries (i.e., allocated based on demands) and deliveries for the simulated Existing Condition and the Proposed Action. The average simulated firm SWP delivery for the Existing Condition was 2,957 taf/yr and was 2,949 taf/yr with the Proposed Action.

The average change in SWP firm deliveries with the Proposed Action would be a slight reduction of 8 taf/yr. The greatest annual reduction was 112 taf in 1947, and the largest increase was 243 taf in 1949. In 50% of the years, the change in SWP firm deliveries was a reduction of 2 taf. Many of these unchanged years are years with fully satisfied demands that do not require any additional SWP deliveries. These simulated changes in SWP water supply are the result of the CVP more fully using required upstream reservoir releases, which the SWP currently uses in proper accordance with the COA and Delta operational rules for sharing the environmental protection requirements (i.e., Delta outflow and E/I limits).

Figure 3.2-2 shows the 1922–1994 sequence of simulated SWP south-of-Delta deliveries for the Existing Condition. As suggested in Figure 3.2-2, the simulated annual change in SWP south-of-Delta deliveries for the Existing Condition is relatively small.

Table 3.2-9 also shows that SWP Article 21 deliveries would be reduced slightly from an average of 134 taf/yr for the Existing Condition simulation to an average of 130 taf/yr with the Proposed Action. This is not considered to be a change in water supply reliability because Article 21 water is available only in wet years when SWP San Luis Reservoir storage is filled, and Article 21 SWP water deliveries can be used only by contractors who have local storage facilities. The Intertie would allow the CVP to pump a small portion of Delta surplus flows otherwise pumped by SWP.

Figure 3.2-3 shows the pattern of simulated San Luis Reservoir carryover storage at the end of September for the 1922–1994 hydrologic sequence. The CVP carryover storage is the final result of all water supply and delivery actions taken each year. The changes in the CVP San Luis Reservoir carryover storage are very small in most years because the rules for reserving a fixed amount in storage, which are assumed to simulate real CVP operations, remain the same with the Proposed Action. The CVP San Luis Reservoir carryover storage is less than 150 taf in about 40% of the years. Figure 3.2-3 also shows the changes in the combined CVP and SWP San Luis carryover storage for the simulated Existing Condition and Proposed Action simulation. The changes in the combined San Luis Reservoir carryover storage are very small. The combined San Luis Reservoir carryover storage is slightly less than 200 taf in only about 10% of the years.

Changes in State Water Project Water Supply Pumping and Deliveries under 2020 LOD

This section identifies changes attributable to implementing the Proposed Action under the simulated 2020 LOD. This is accomplished by comparing the CALSIM II model results for 2020 with the Proposed Action (i.e., Proposed Action) and 2020 without the Proposed Action (i.e., No Action).

Pumping

Table 3.2-10 provides a summary of simulated monthly SWP pumping for the No Action (2020 LOD). Comparing the simulated No Action level of pumping against that of a simulated No Action level of pumping with the Proposed Action, the annual average total change in distribution is a reduction of 23 taf/yr.

Deliveries

Table 3.2-9 gives the simulated annual (water year) SWP south-of-Delta deliveries for the No Action (2020 LOD) and Proposed Action. The simulated changes for No Action and the Proposed Action SWP firm deliveries shown in Table 3.2-10 indicate an average annual decrease in deliveries of 13 taf/yr. SWP Article 21 water average annual deliveries decreased by 2 taf/yr.

Figure 3.2-2 shows the 1922–1994 sequence of simulated SWP south-of-Delta deliveries for the simulated No Action Condition. As suggested in Figure 3.2-2, the simulated annual change in SWP south-of-Delta deliveries for the simulated No Action Condition is relatively small.

Evaluation of Remaining Export Capacity for Water Transfers

The CALSIM II modeling of the simulated Existing Condition and simulated No Action Condition, as well as the simulated Proposed Action under both these conditions, indicates that in many years there will be unused pumping capacity during the July–September period that may be available for moving additional water transfers through the Delta. This is the major "window of opportunity" for water transfers because the allowable E/I ratio is 65%, there are high water demands for beneficial uses of additional water, and there are relatively few fish-related impacts along the river corridors and within the Delta channels during these months.

The Proposed Action will have a negligible effect on this transfer opportunity because the summer pumping capacity is not increased substantially by the Proposed Action. The CVP Tracy pumping during the months of July–September is nearly at the authorized capacity of 4,600 cfs in a majority of the years under the simulated Existing Condition. The slight increase allowed by the Proposed Action will not reduce the available transfer capacity because the Proposed Action raises the physical capacity of the Tracy Pumping Plant, and no

Table 3.2-9. CALSIM II-Simulated Average Annual Total SWP South of Delta Deliveries (taf) for Existing Condition (2001 LOD) and No Action (2020 LOD)

	2001						2020					
	Firm			Article 21			Firm			Article 21		
Year	Existing Condition	Proposed Action	Change	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Change	No Action	Proposed Action	Change
1922	3423	3422	-1	123	125	2	4015	4012	-3	0	0	0
1923	3603	3604	1	252	246	-6	3821	3812	-9	0	0	0
1924	1607	1581	-26	0	0	0	1481	1453	-28	0	0	0
1925	1343	1318	-25	0	0	0	1280	1285	5	27	9	-18
1926	2710	2747	37	239	187	-52	2665	2680	15	140	130	-9
1927	3419	3426	6	193	192	-1	3823	3820	-3	86	88	2
1928	3358	3350	-8	156	153	-3	3403	3377	-26	0	0	0
1929	1540	1513	-27	0	0	0	1529	1502	-27	0	0	0
1930	2531	2508	-23	76	53	-23	2419	2406	-13	46	48	2
1931	1545	1514	-32	0	0	0	1560	1541	-19	0	0	0
1932	1525	1461	-64	160	150	-10	1615	1593	-22	68	63	-5
1933	1446	1425	-21	398	398	0	1636	1669	33	277	274	-3
1934	1683	1661	-21	79	76	-3	1770	1724	-46	0	0	0
1935	3185	3181	-5	63	63	0	3304	3292	-12	23	31	8
1936	3737	3737	0	0	0	0	3776	3766	-10	0	0	0
1937	3439	3418	-21	69	51	-18	3394	3377	-17	60	35	-25
1938	3402	3395	-6	340	330	-10	3978	3975	-3	134	131	-3
1939	3509	3505	-5	258	281	22	3659	3529	-130	0	0	0
1940	3555	3554	-1	101	100	-1	3767	3732	-35	18	15	-3
1941	3130	3130	-1	50	50	0	3501	3528	27	0	0	0
1942	3395	3395	0	470	470	0	3747	3748	1	371	340	-32
1943	3504	3499	-4	430	430	0	3605	3601	-4	357	358	1
1944	3540	3536	-4	0	0	0	3567	3534	-33	0	0	0
1945	3540	3540	0	132	132	0	3803	3775	-28	47	87	40

Table 3.2-9. Continued

	2001						2020					
	Firm			Article 21			Firm			Article 21		
Year	Existing Condition	Proposed Action	Change	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Change	No Action	Proposed Action	Change
1946	3682	3684	2	0	0	0	3778	3772	-5	0	0	0
1947	2853	2741	-112	0	0	0	2832	2716	-117	0	0	0
1948	2828	2822	-7	0	0	0	2866	2883	17	0	0	0
1949	2149	2392	243	0	0	0	2311	2201	-110	0	0	0
1950	3108	3026	-82	0	0	0	3022	3050	28	0	0	0
1951	3752	3718	-34	262	292	30	3982	3995	13	216	175	-41
1952	3124	3124	0	50	50	0	3522	3522	0	14	14	1
1953	3571	3571	0	425	417	-8	3879	3879	0	292	273	-18
1954	3765	3764	-1	207	166	-41	3967	3881	-86	0	0	0
1955	2089	2039	-51	0	0	0	1967	1962	-4	0	0	0
1956	3189	3178	-11	262	262	0	3527	3535	8	246	248	2
1957	3422	3393	-30	133	101	-32	3345	3249	-96	0	0	0
1958	3394	3394	-1	322	300	-21	3710	3688	-22	248	249	1
1959	3526	3518	-8	144	130	-14	3551	3535	-17	33	0	-33
1960	2009	2001	-8	0	0	0	2234	2211	-23	0	0	0
1961	2635	2606	-29	84	66	-18	2367	2387	20	0	0	0
1962	3173	3157	-16	45	23	-22	3174	3187	14	0	0	0
1963	3571	3570	-1	147	142	-5	3939	3941	2	85	77	-8
1964	3458	3416	-42	0	0	0	3297	3190	-107	0	0	0
1965	3246	3228	-18	62	66	4	3144	3131	-13	0	0	0
1966	3589	3587	-2	262	229	-33	3751	3747	-4	142	107	-35
1967	3398	3398	0	262	261	0	3891	3889	-2	124	124	0
1968	3515	3510	-4	604	587	-17	3702	3698	-4	424	392	-32
1969	3144	3143	-1	50	50	0	3453	3452	-1	42	42	0
1970	3539	3539	0	395	398	4	3864	3864	0	414	414	0
1971	3722	3722	0	0	0	0	3888	3891	3	0	0	0
1972	3130	3104	-26	4	0	-4	2928	2820	-108	0	0	0

Table 3.2-9. Continued

	2001						2020					
	Firm			Article 21			Firm			Article 21		
Year	Existing Condition	Proposed Action	Change	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Change	No Action	Proposed Action	Change
1973	3441	3435	-7	262	262	0	3501	3474	-27	251	309	57
1974	3563	3564	1	291	291	0	3960	3958	-2	179	179	0
1975	3617	3617	0	281	282	0	3992	3991	-1	156	125	-32
1976	3289	3265	-24	67	75	8	3176	3189	13	0	0	0
1977	1093	1100	8	0	0	0	1030	1039	10	0	0	0
1978	2545	2548	3	100	100	0	3074	3073	-2	100	100	0
1979	3446	3445	-1	153	143	-11	3748	3748	0	78	82	4
1980	3190	3190	0	50	50	0	3521	3517	-4	40	40	0
1981	3522	3525	3	250	220	-30	3578	3551	-27	0	0	0
1982	3418	3420	2	240	240	0	3861	3855	-5	55	58	3
1983	3001	3001	0	228	215	-12	3377	3377	0	149	149	0
1984	3473	3473	0	451	451	0	3836	3836	0	428	428	0
1985	3631	3582	-50	0	0	0	3501	3452	-49	0	0	0
1986	3225	3198	-27	0	0	0	3175	3160	-15	15	16	1
1987	3135	3074	-61	0	0	0	3024	2997	-27	0	0	0
1988	1340	1358	18	0	0	0	1328	1368	40	0	0	0
1989	2632	2637	4	0	0	0	2656	2681	25	0	0	0
1990	1561	1559	-2	0	0	0	1591	1598	7	0	0	0
1991	975	975	1	0	0	0	980	981	1	0	0	0
1992	1168	1217	49	0	0	0	1182	1243	61	0	0	0
1993	3056	3071	14	130	130	0	3474	3488	14	66	60	-6
1994	3312	3275	-37	0	0	0	3067	3087	20	0	0	0
Avg.	2957	2949	-8	134	130	-4	3091	3078	-13	75	72	-2
Min.	975	975	-112	0	0	-52	980	981	-130	0	0	-41
Max.	3765	3764	243	604	587	30	4015	4012	61	428	428	57

Table 3.2-9. Continued

	2001						2020					
	Firm			Article 21			Firm			Article 21		
Year	Existing Condition	Proposed Action	Change	Existing Condition	Proposed Action	Change	No Action	Proposed Action	Change	No Action	Proposed Action	Change
Percentile Distribution												
Min	975	975	-112				980	981	-130			
10%	1,541	1,513	-36				1,566	1,551	-48			
20%	2,302	2,438	-26				2,334	2,281	-27			
30%	2,942	2,930	-19				2,984	2,951	-18			
40%	3,142	3,140	-7				3,175	3,188	-9			
50%	3,289	3,265	-2				3,453	3,452	-4			
60%	3,419	3,402	-1				3,532	3,530	-1			
70%	3,464	3,457	0				3,725	3,711	0			
80%	3,540	3,538	1				3,814	3,797	9			
90%	3,601	3,586	4				3,890	3,887	19			
Max	3,765	3,764	243				4,015	4,012	61			

Table 3.2-10. Monthly Distribution of SWP Banks Pumping for No Action (2020 LOD) and Proposed Action Conditions

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (taf)
A. No Action (2020 LOD) Pumping (cfs)													
min	555	300	1,237	1,597	906	300	300	300	300	300	329	982	
10%	1,390	1,305	2,216	4,415	2,256	1,717	623	392	527	2,346	1,829	2,062	
20%	2,092	1,987	3,073	5,350	3,517	2,843	1,298	1,107	1,955	3,159	4,836	4,332	
30%	3,020	2,747	3,907	5,934	4,320	3,964	1,767	1,609	2,827	3,757	6,152	5,038	
40%	3,439	3,107	4,366	6,535	5,378	4,978	2,164	1,881	3,362	4,358	6,527	5,157	
50%	3,805	3,724	4,417	7,120	5,947	6,549	2,413	2,022	3,819	5,004	6,680	5,451	
60%	4,370	4,737	4,604	7,274	6,756	6,947	2,835	2,381	4,193	6,108	6,680	5,743	
70%	5,063	5,995	5,288	7,367	7,711	7,180	3,032	3,096	5,286	6,853	6,680	6,291	
80%	6,064	6,680	6,977	7,881	8,375	7,388	3,032	3,274	5,843	7,180	6,745	6,680	
90%	6,680	6,680	7,051	8,494	8,500	7,561	3,432	3,600	6,680	7,180	7,180	7,180	
Max	6,680	6,680	7,678	8,500	8,500	7,561	3,432	3,637	6,680	7,180	7,180	7,180	
Avg	3,962	4,071	4,655	6,585	5,738	5,281	2,239	2,107	3,803	4,959	5,755	5,218	3,264
B. Proposed Action Pumping (cfs)													
min	548	317	1,243	1,596	300	300	300	300	300	300	329	982	
10%	1,458	1,309	2,251	4,008	2,257	1,743	628	429	480	1,121	1,434	2,045	
20%	2,066	2,044	3,079	5,188	3,516	2,955	1,357	1,104	1,940	2,542	4,951	4,275	
30%	2,993	2,599	3,880	5,708	4,345	3,920	1,760	1,609	2,843	3,244	5,961	4,704	
40%	3,504	3,212	4,415	6,355	5,045	4,837	2,165	1,881	3,408	4,057	6,391	5,019	
50%	3,807	3,513	4,559	7,106	5,793	6,548	2,413	2,022	3,914	4,768	6,680	5,282	
60%	4,544	4,620	4,658	7,264	6,756	6,869	2,835	2,399	4,240	6,080	6,680	5,598	
70%	5,048	5,639	5,101	7,368	7,711	7,148	3,032	3,096	5,294	6,838	6,680	6,178	
80%	5,798	6,680	6,977	7,881	8,375	7,329	3,032	3,274	5,832	7,180	6,752	6,680	
90%	6,680	6,680	7,065	8,500	8,500	7,561	3,432	3,600	6,680	7,180	7,180	7,180	
Max	6,680	6,680	7,678	8,500	8,500	7,561	3,432	3,637	6,680	7,180	7,180	7,180	
Avg	3,944	3,978	4,644	6,480	5,682	5,281	2,243	2,108	3,823	4,686	5,696	5,139	3,241
C. Change in Monthly Distribution (cfs)													
min	-7	17	5	-1	-606	0	0	0	0	0	0	0	
10%	69	4	34	-407	2	26	5	37	-48	-1,225	-395	-18	
20%	-25	57	7	-162	-1	113	59	-3	-15	-617	115	-57	
30%	-26	-148	-27	-227	25	-44	-7	0	15	-513	-191	-334	
40%	65	105	49	-180	-333	-141	1	0	46	-301	-136	-138	
50%	1	-211	142	-15	-154	-1	0	0	94	-236	0	-169	
60%	174	-117	55	-10	0	-79	0	19	47	-28	0	-145	
70%	-14	-356	-187	1	1	-33	0	0	8	-15	0	-114	
80%	-267	0	0	0	0	-60	0	0	-11	0	7	0	
90%	0	0	14	6	0	0	0	0	0	0	0	0	
Max	0	0	0	0	0	0	0	0	0	0	0	0	
Avg	-18	-93	-10	-105	-56	0	5	1	19	-273	-58	-79	-23

transfers occur at Tracy. Therefore, no further consideration of possible impacts on the transfer opportunity for additional water supply is required.

3.2.4 Cumulative Impacts

Quantitative Analysis

Comparison of CALSIM II Results for 2001 and 2020 Levels of Development

The possible contribution of the Proposed Action to future cumulative water supply effects has been addressed with CALSIM II simulations of the 2020 LOD (see Appendix B). However, no new CVP or SWP facilities have been included in these 2020 simulations. Therefore, the demands for water supply upstream and south of the Delta (SWP demands) are the only changes in these 2020 simulations. The operations of upstream reservoirs and the resulting Delta inflows are nearly identical. This has been indicated in the reservoir carryover storage graphs (in Appendix C), where the 2001 baseline and the 2020 baseline values have been compared. The simulated Existing Condition and No Action Condition are also shown in tables of water supply releases at Keswick, Thermalito, Nimbus, and Goodwin Dams, where the annual changes from 2001 to 2020 simulations have been given. The American River releases are substantially reduced (from higher local water supply demands) in the 2020 simulations. The corresponding San Joaquin River and Sacramento River Delta annual inflow patterns are nearly identical. The corresponding CVP Tracy pumping and SWP Banks pumping are very nearly identical between the Existing Condition and No Action simulations. The simulated effects of the Proposed Action on these CVP and SWP pumping patterns are also nearly identical.

Table 3.2-6 shows the monthly distribution of CVP Tracy pumping simulated with CALSIM II for No Action and the Proposed Action. The monthly distribution for these 2020 simulations can be compared to the 2001 monthly distributions shown in Table 3.2-4. The results are nearly identical. The Proposed Action was responsible for a 65-taf/yr increase in pumping at the CVP Tracy Pumping Plant under future 2020 LOD conditions. This is very close to the average increase of 64 taf/yr simulated for the Existing Condition.

Table 3.2-10 gives the monthly distribution of SWP Banks pumping simulated with CALSIM II for No Action and the Proposed Action. The monthly distribution for these 2020 simulations can be compared to the 2001 monthly distributions shown in Table 3.2-8. The results are nearly identical. The Proposed Action was responsible for a 23-taf/yr increase in pumping at the SWP Banks Pumping Plant under future 2020 LOD conditions. This is less than the average decrease of 39 taf/yr simulated for the Existing Condition.

Figure 3.2-4 shows that although the Proposed Action is assumed to be operable in all months of the year up to full capacity in the CALSIM II modeling runs for

both the simulated 2001 LOD and 2020 LOD, the average use of the Intertie to allow increased pumping at the CVP Tracy Pumping Plant is greatest in the fall and winter months. July and August also show a small amount of Intertie use. The total Intertie use was simulated to be about 53 taf/yr for the Existing Condition and about 51 taf/yr for No Action. Figure 3.2-5 shows that the Intertie facility enables the Tracy Pumping Plant to be operated at its maximum capacity of 4,600 cfs in months where the upper DMC restrictions would not have otherwise enabled this to occur. Figure 3.2-6 indicates that the Intertie facility use appears to be rather well distributed across all hydrologic years. The Intertie facility is used in about 95% of the simulated years for both the 2001 LOD and 2020 LOD. This can be explained by noting that even in the driest sequence of years, there are a number of months of surplus Delta flows that can be captured through the use of the Intertie.

The restored CVP export capacity provided by the Intertie would result in changes to deliveries as summarized by and Figures 3.2-7 and 3.2-8. Figures 3.2-7 and 3.2-8 show annual changes in CVP and SWP total deliveries for the Intertie study compared to the simulated Existing Condition and simulated No Action. The CALSIM II results indicate a decrease in SWP south-of-Delta delivery. The SWP delivery reductions are greater during the dry period of 1928–1934. The greatest contributor to this decrease is the increased CVP ability to capture CVP supplies at Tracy that were previous captured by the SWP at Banks. Appendix B contains further analysis of these CALSIM II simulation results for the Proposed Action.

Qualitative Analysis

Those actions that are considered reasonably foreseeable and that would contribute to potential cumulative impacts are included in this analysis. The qualitative analysis of cumulative effects below attempts to take into account other projects that are being considered by various entities but which have not been sufficiently defined to be considered “reasonably foreseeable.”

Other Projects and Programs

CALFED Bay-Delta Program

The CALFED Program is a collaborative effort by State and Federal agencies and stakeholders from key interest sectors created to address and resolve resource management issues in the Bay-Delta system. The mission of CALFED is to develop and implement a comprehensive plan that addresses resource problems in the Bay-Delta related to water supply reliability, levee system integrity, water quality, and the ecosystem. The CALFED ROD identifies a number of studies to be implemented to address resource management issues. Several of these studies include feasibility studies of major water resources projects and programs that could interact cumulatively with the Intertie project and other cumulative actions assumed and included in the CALSIM II modeling. These potential projects include:

- North of Delta Offstream Storage, a study of a major water supply storage reservoir in northern California;
- Shasta Lake Water Resources Investigation, a study to explore the expansion of the lake to increase yield;
- In-Delta Storage, which is examining the potential for water storage on islands in the Delta;
- San Luis Reservoir Low Point Improvement Project, which is exploring alternatives for addressing water quality problems in the reservoir during periods of low storage;
- South Delta Improvements Program, which involves developing a project and alternatives that would allow increased exports from the Delta while minimizing effects on water quality, fisheries, and water levels in the south Delta;
- Los Vaqueros Reservoir Expansion Project, which is exploring the benefits and opportunities associated with expanding the reservoir;
- Upper San Joaquin River Storage, which is studying the potential to increase storage capacity by raising Friant Dam or a similar storage program;
- Groundwater Conjunctive Management Project, which is intended to increase water supply reliability statewide through the planned, coordinated local management and use of groundwater and surface water resources.
- Environmental Water Account, which acquires water assets from willing sellers and uses the assets to replace projet water not pumped during previous pumping curtailments at Reclamation's and DWR's export facilities that were required to protect at-risk native fish of the Delta (an EIS/EIR for the short-term EWA program was completed and its companion Record of Decision signed in March 2004 and Notice of Determination and Findings filed with the State Clearinghouse, also in March 2004);
- Bay Area Quality and Supply Reliability Program, which is intended to develop and coordinate regional blending and exchange concepts that can improve water quality and water supply reliability for several Bay Area water agencies;
- Old River and Rock Slough Water Quality Improvement Projects (Veale/Byron Tract Drainage Reduction), which are intended to minimize salinity and other constituents of concern in drinking water by relocating or reducing agricultural drainage in the south Delta to improve drinking water quality for CCWD; and
- Ecosystem Restoration Program, which involves extensive habitat restoration throughout the Sacramento and San Joaquin Valleys.

Each of these programs is in the very early planning and feasibility stages. They have not been adopted in any planning document or official plan beyond a highly programmatic environmental document. No firm description of some of these project and programs is available, and many do not have a schedule for environmental compliance or project implementation. It is highly unlikely that

all of these projects will move forward into the implementation stage. In addition, those that are ultimately implemented likely will be staged over a period of several years. It is therefore speculative to include a discussion of these projects and programs in this analysis. However, because of the inherently interrelated nature of major water resources programs in northern and central California, they are included in this qualitative analysis.

There are also other actions and programs being evaluated and implemented by CALFED agencies that could conceivably contribute to cumulative impacts. However, these are also relatively undefined at this time, and it would be speculative to attempt to include these other programs in a cumulative impact analysis.

Freeport Regional Water Project

The Freeport Regional Water Project (FRWP) is a regional water supply project being developed on the Sacramento River near the town of Freeport by the Sacramento County Water Agency (SCWA) and the East Bay Municipal Utility District (EBMUD), in close coordination with the City of Sacramento and Reclamation. The project is designed to help meet future drinking water needs in the central Sacramento County area and supplement aggressive water conservation and recycling programs in the East Bay to provide adequate water supply during future drought periods.

FRWP will provide up to 100 mgd of water for EBMUD to use during drought years and 85 mgd for SCWA for use in all years. The project would divert water from the Sacramento River and deliver it to a Sacramento County Treatment facility and the Folsom South Canal. From the Folsom South Canal, water will be delivered to the Mokelumne Aqueducts. This project would require the construction of fish screens and a pumping plant at the intake on the Sacramento River, a water treatment facility in Sacramento County, and pipeline facilities to transport the water from Freeport to the Mokelumne Aqueduct.

A draft EIR/EIS for FRWP was released in July 2003, and the project was approved by the Freeport Regional Water Authority. The EIR was certified in April 2004, and a ROD is expected to be signed in August 2004.

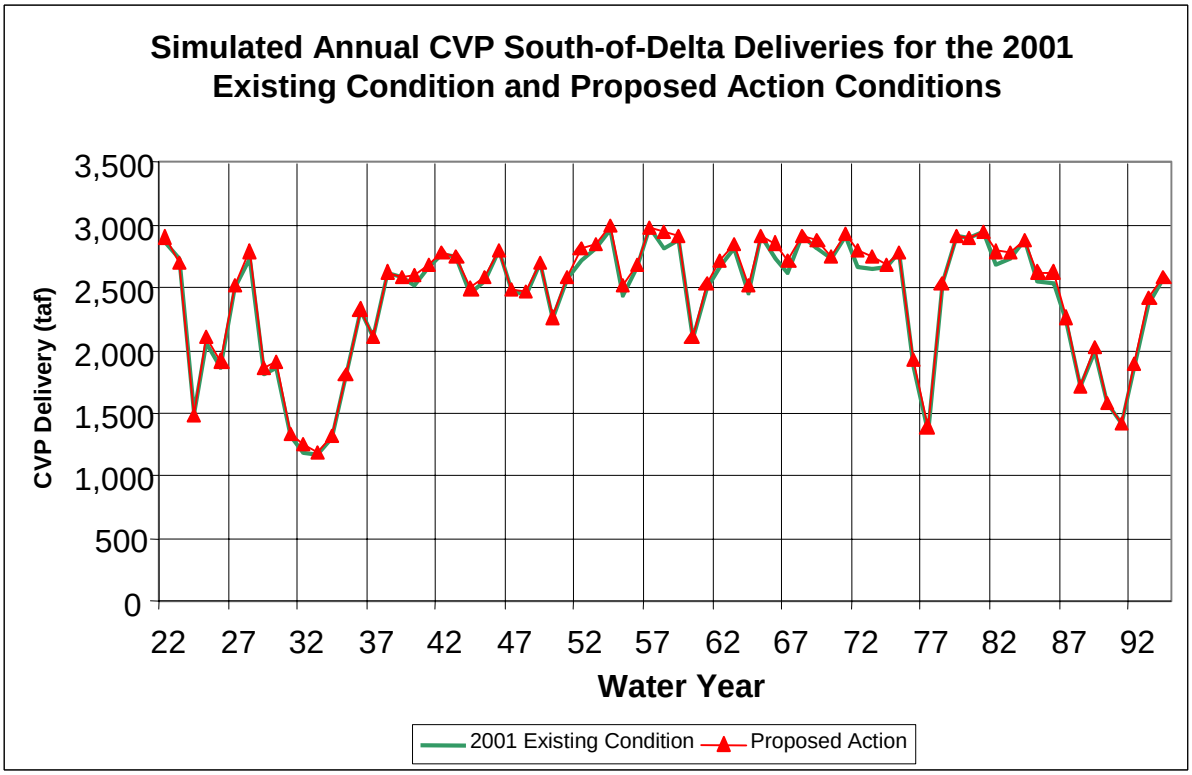
Effects on Water Supply

As indicated above and in the respective resource sections, the Proposed Action has little potential to contribute to any significant cumulative impacts. Reclamation is obligated to meet specific Delta outflow requirements. Implementation of the proposed action would not contribute to any cumulative impacts. Most of the projects described above would substantially increase water availability in the CVP and SWP system. It is possible that instream flows in affected streams would also be increased.

The cumulative effects of the Proposed Action in combination with implementation of other potential future projects conceivably could substantially

increase the amount of water available to the CVP and SWP. In addition, several of the projects discussed above could result in improved water quality throughout the system and particularly within the Delta. These projects would generally result in increased flows into the Delta, increased exports from the Delta for water supply purposes, and increased Delta outflows for environmental and water quality purposes.

Figure 3.2-1. CALSIM II–Simulated CVP South-of-Delta Deliveries for Existing Condition (2001 LOD) and No Action (2020 LOD) and the Proposed Action



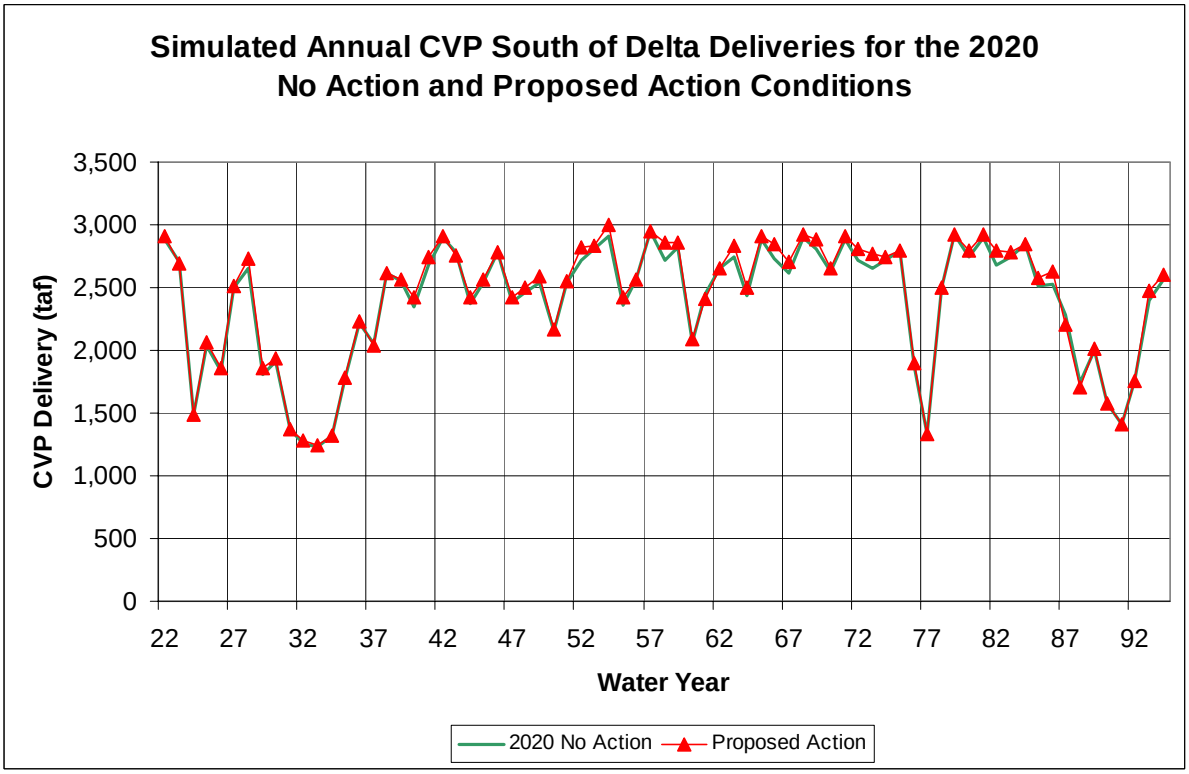
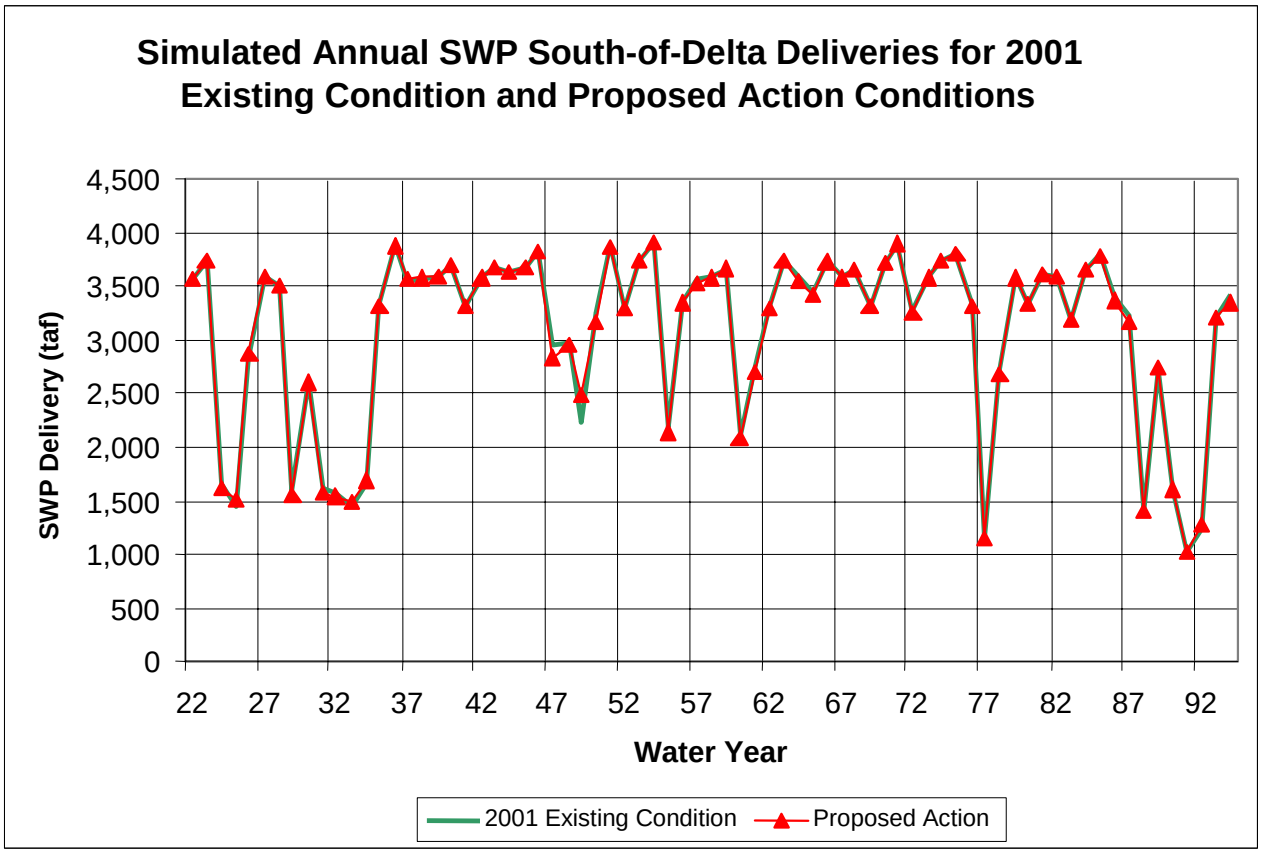


Figure 3.2-2. CALSIM–Simulated SWP South-of-Delta Deliveries for Existing Condition (2001 LOD) and No Action (2020 LOD) and Proposed Action



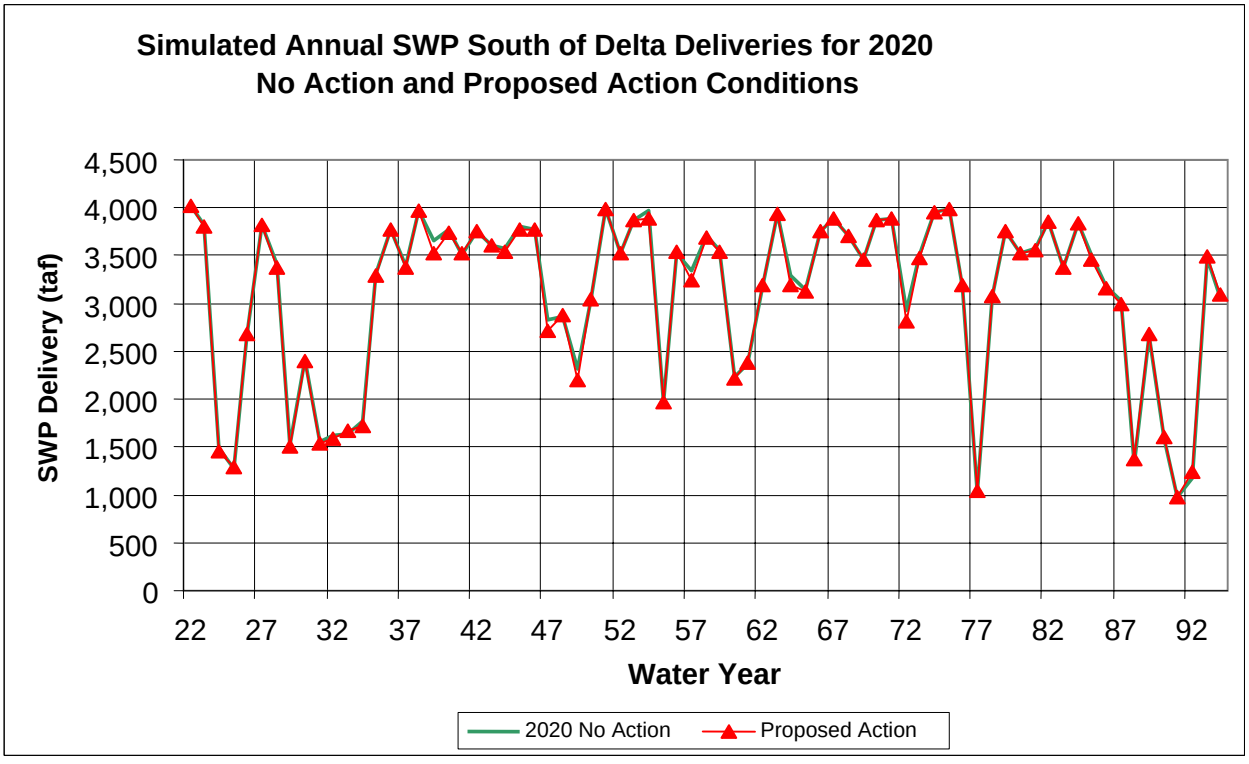
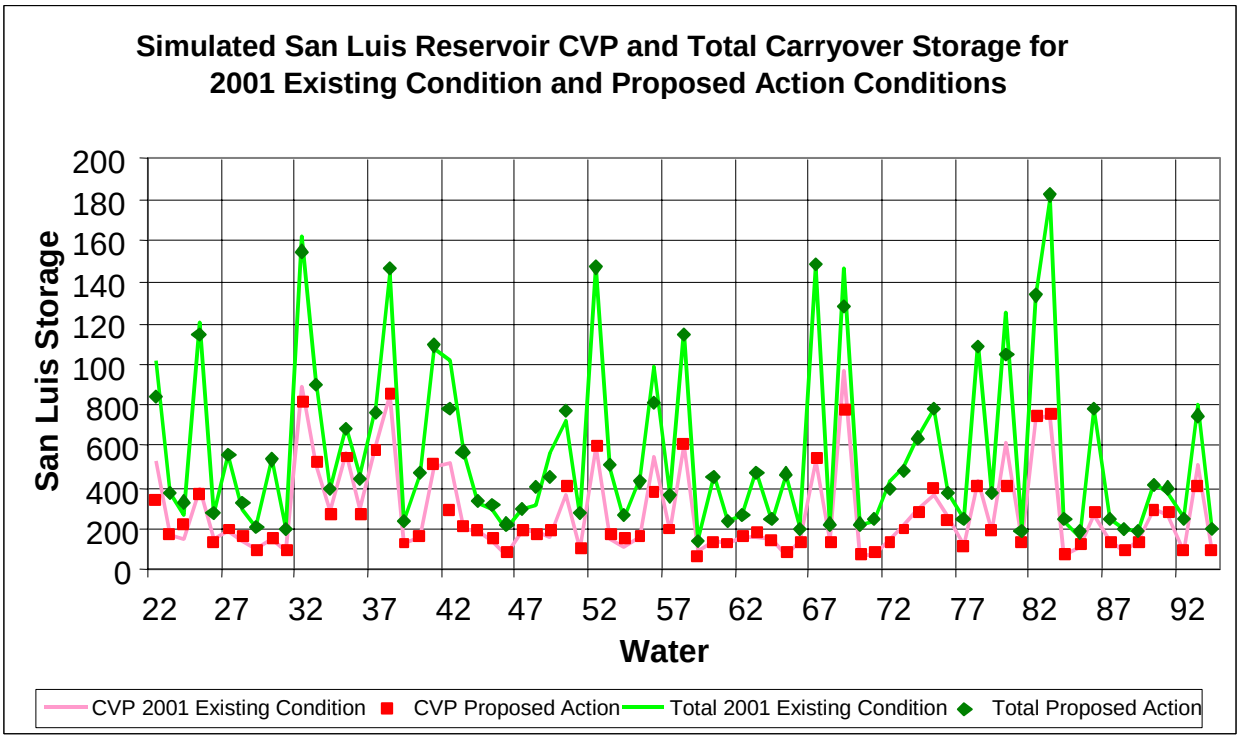


Figure 3.2-3. CALSIM–Simulated San Luis Reservoir Carryover Storage (CVP and Total) for Existing Condition (2001 LOD) and No Action (2020 LOD) and Proposed Action



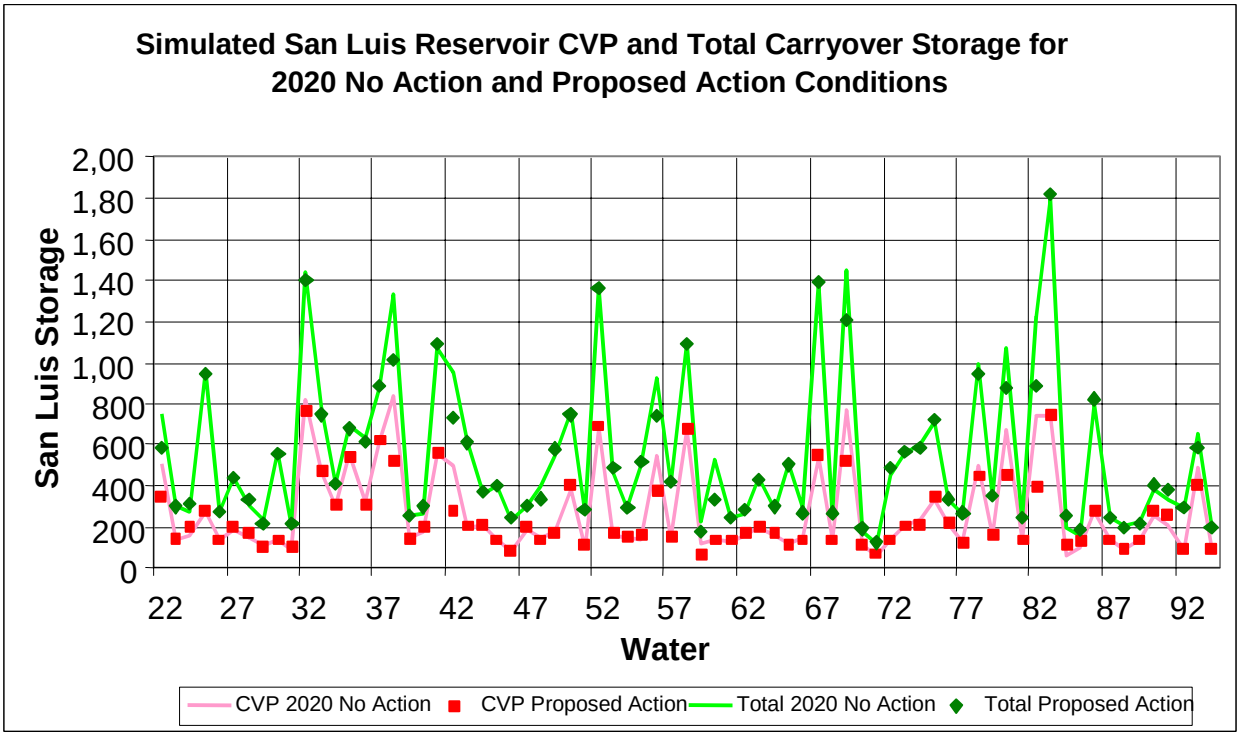
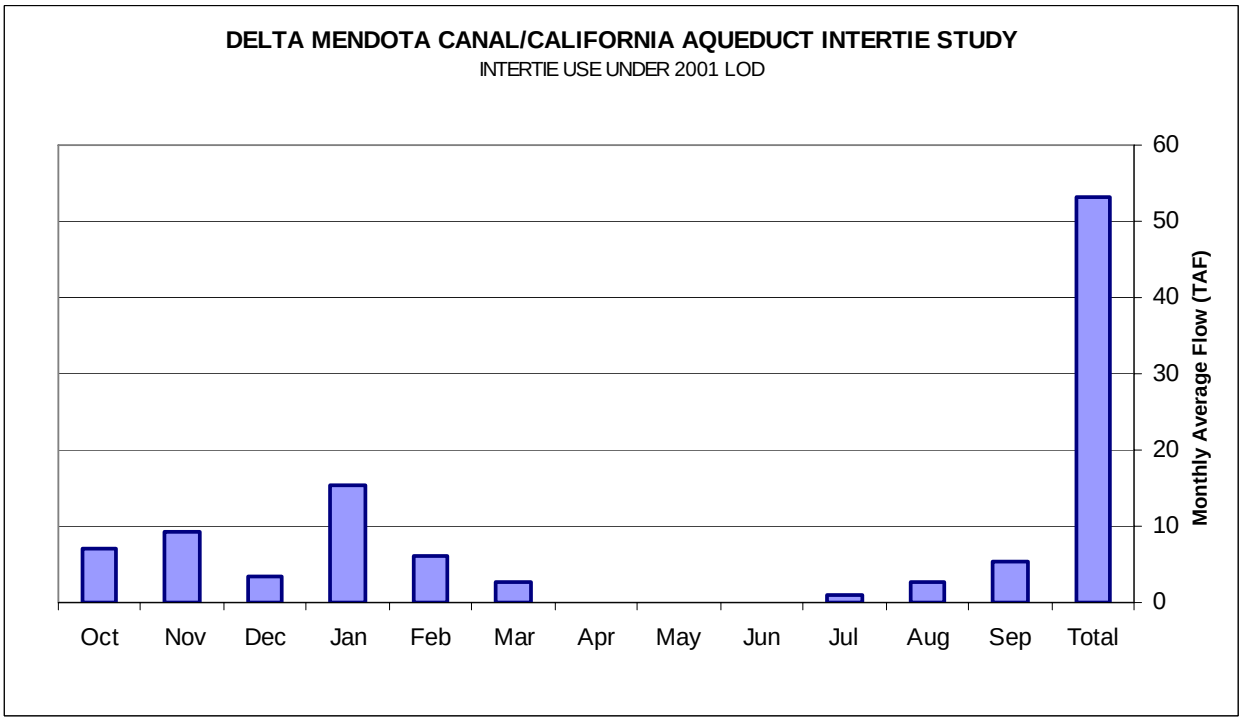


Figure 3.2-4. CALSIM–Simulated Monthly Average Intertie Flows (taf) under Existing Condition (2001 LOD) and No Action (2020 LOD)—Taken from Appendix B



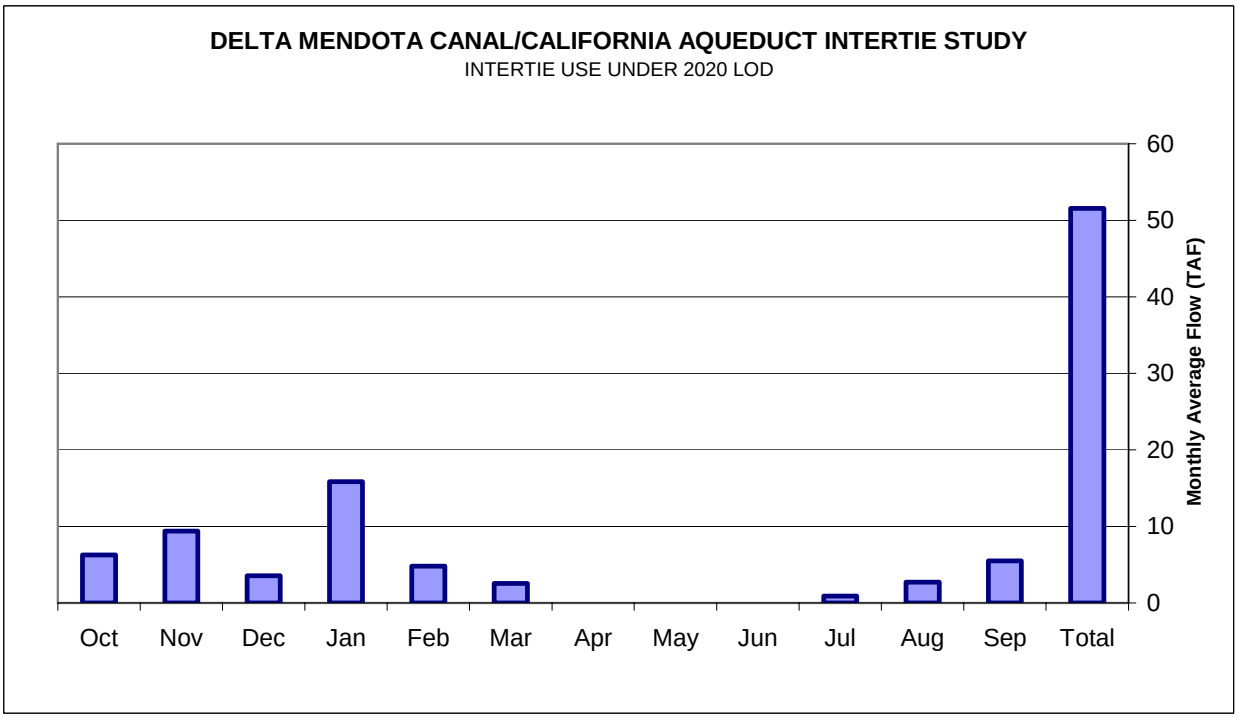
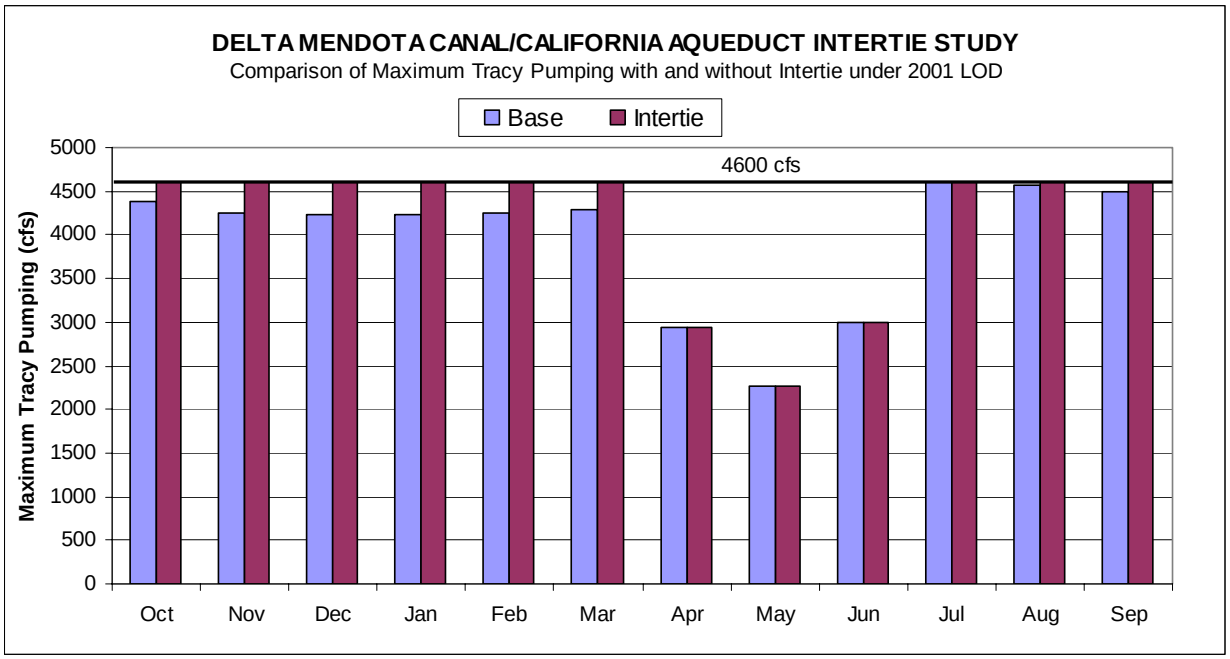


Figure 3.2-5. CALSIM II–Simulated Monthly Maximum Tracy Pumping (cfs) under Existing Condition (2001 LOD) and No Action (2020 LOD)—Taken from Appendix B



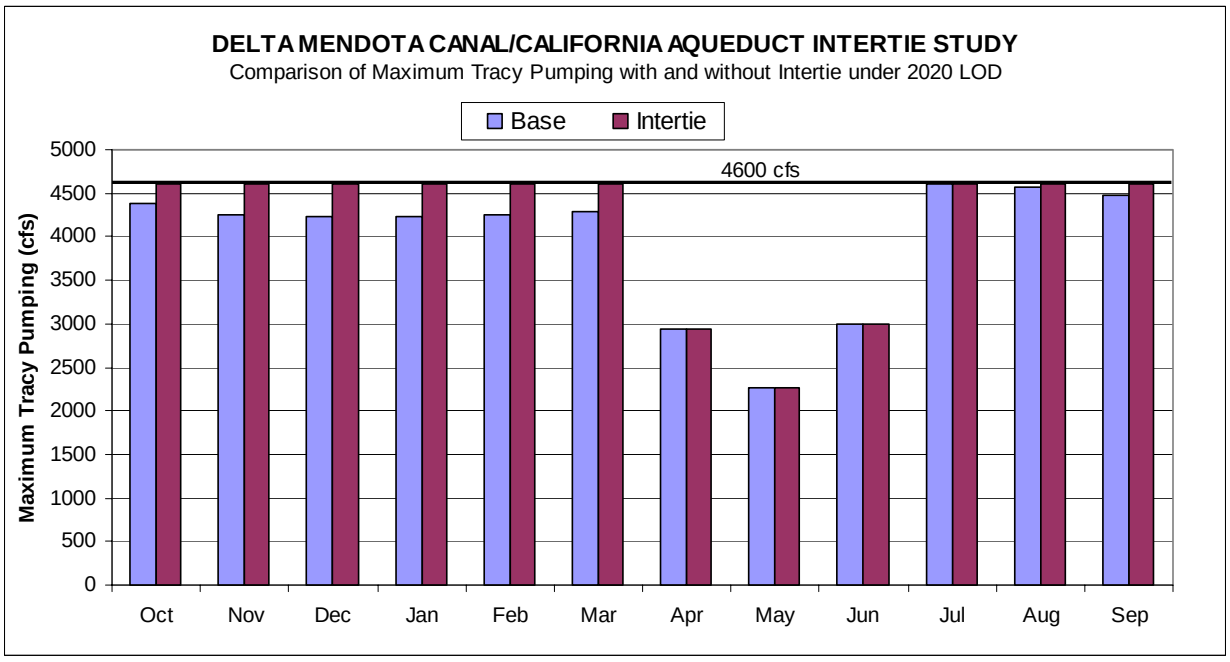
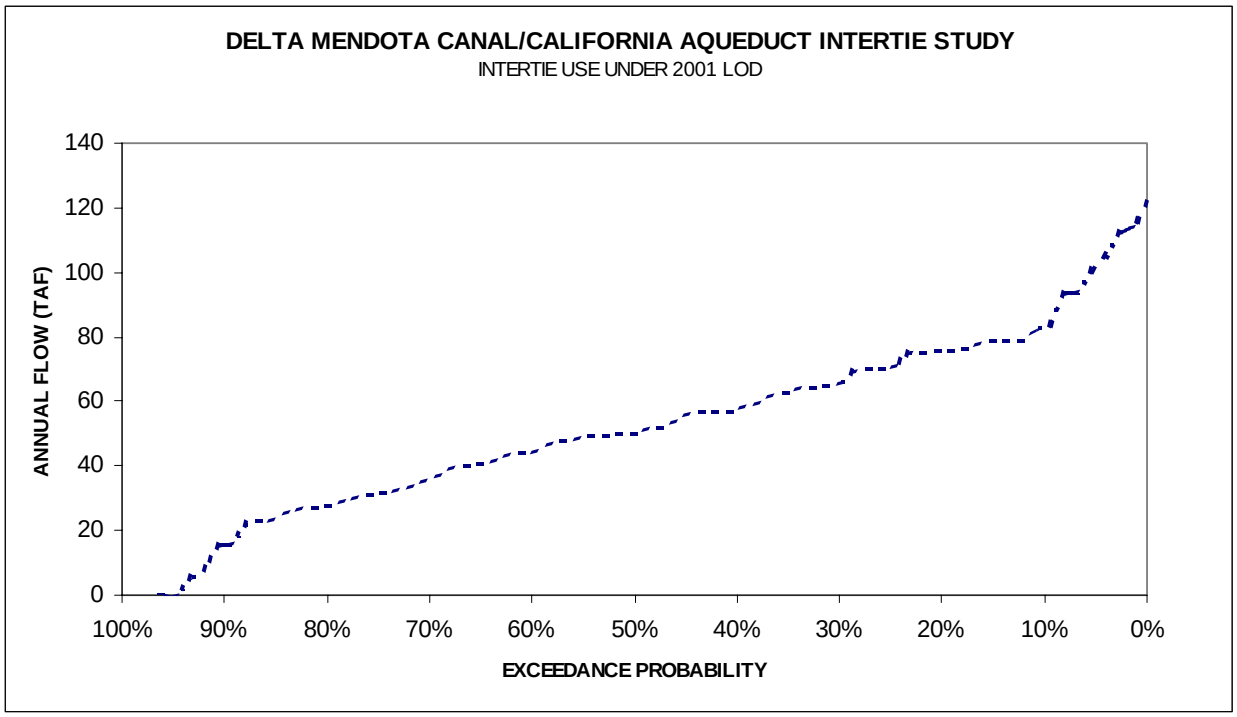


Figure 3.2-6. CALSIM II–Simulated Exceedance Probability of Annual Intertie Use (taf/year) under Existing Condition (2001 LOD) and No Action (2020 LOD)—Taken from Appendix B



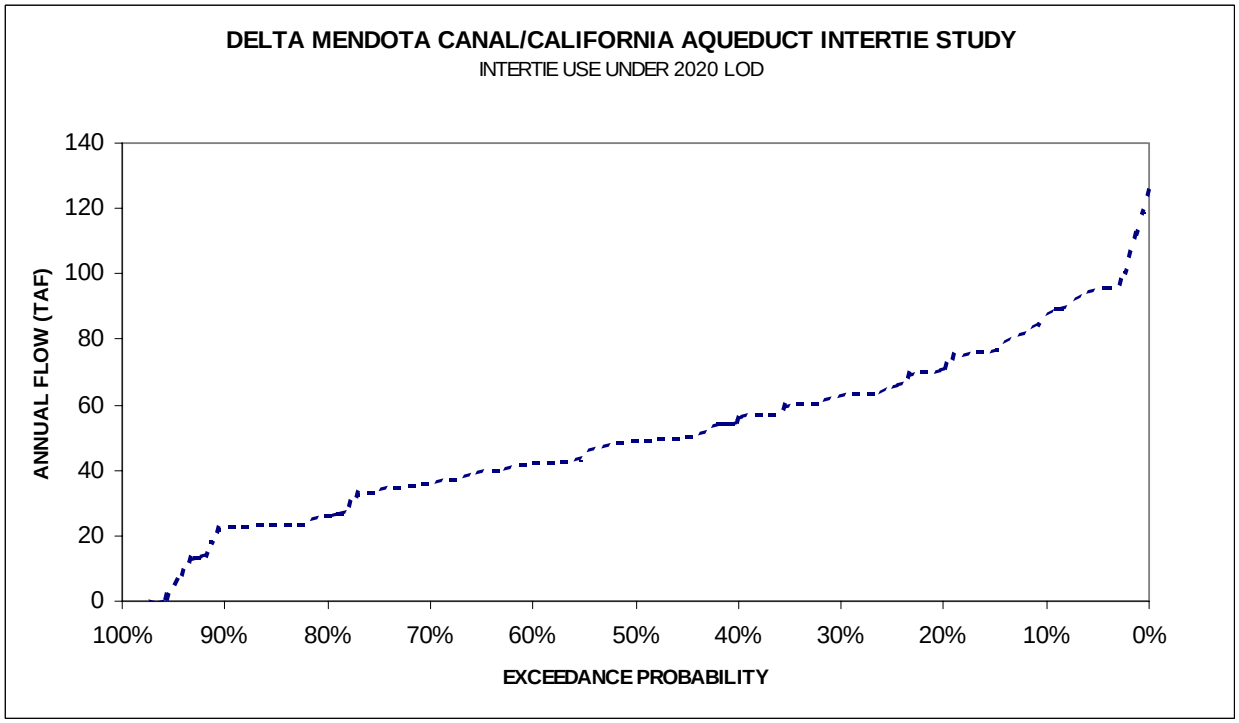
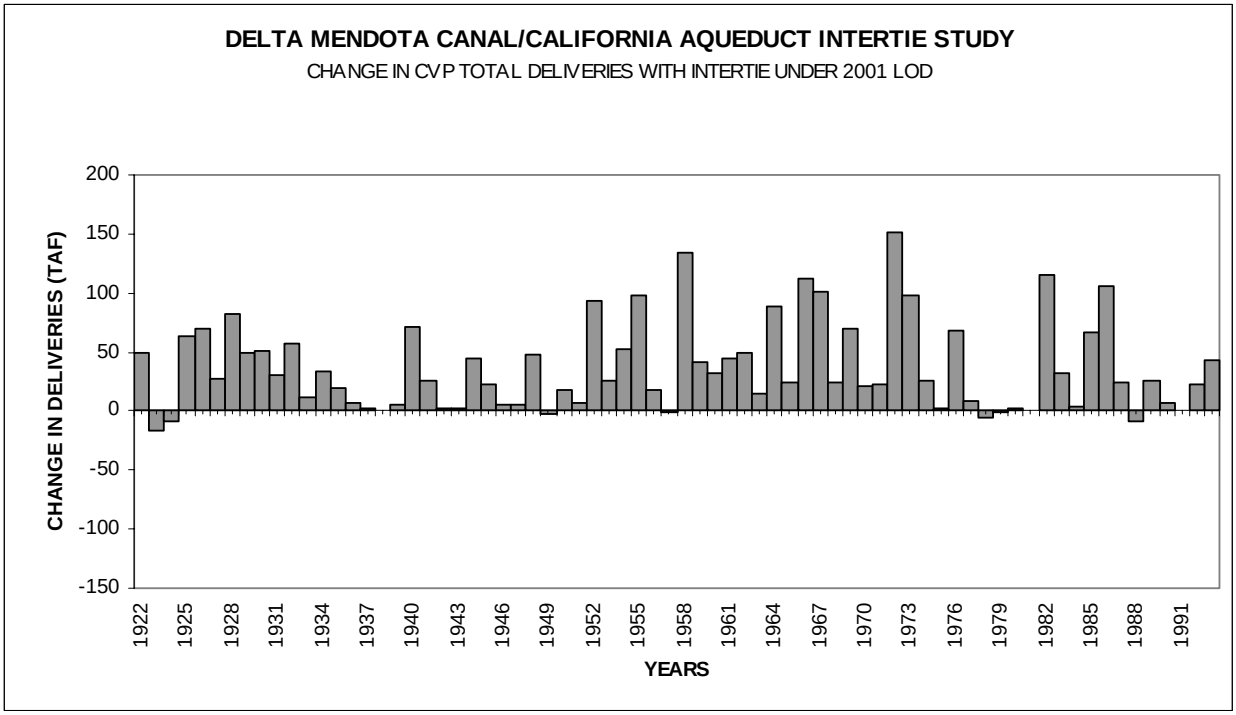


Figure 3.2-7. CALSIM II–Simulated Change In Annual CVP Total Deliveries with Intertie under Existing Condition (2001 LOD) and No Action (2020 LOD)—Taken from Appendix B



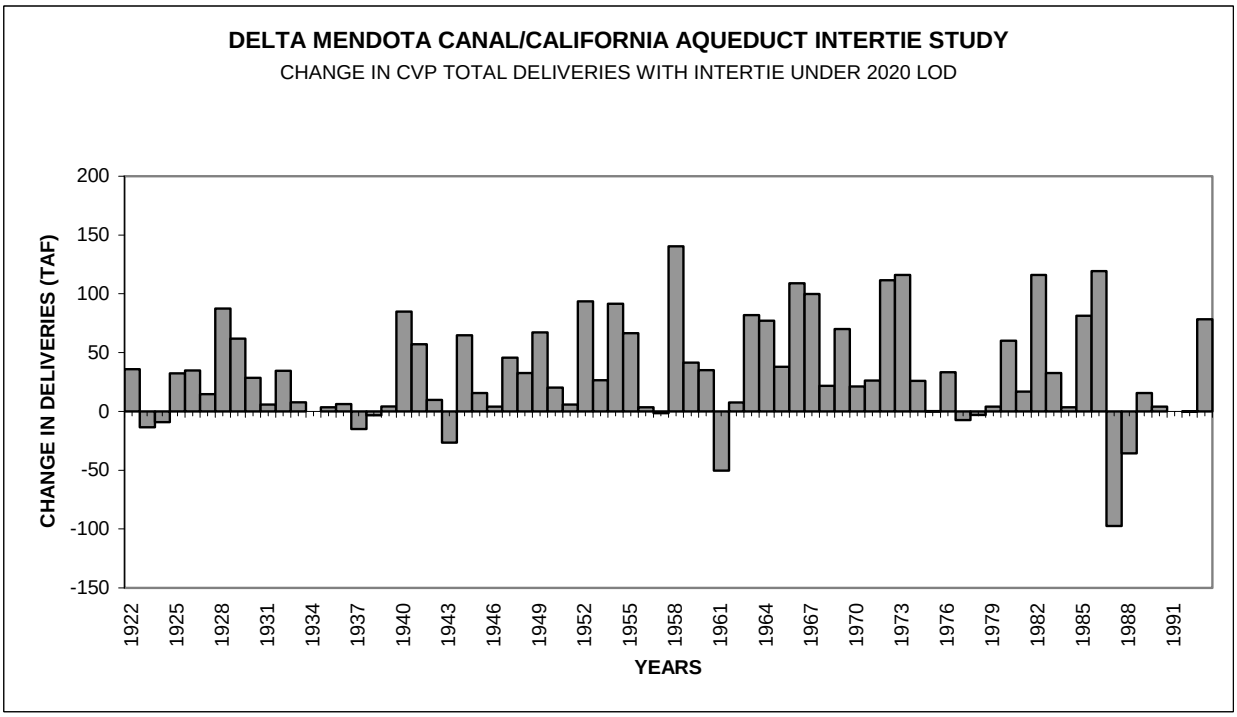


Figure 3.2-8. CALSIM II–Simulated Change In SWP South-of-Delta Deliveries with Intertie under Existing Condition (2001 LOD) and No Action (2020 LOD)—Taken from Appendix B